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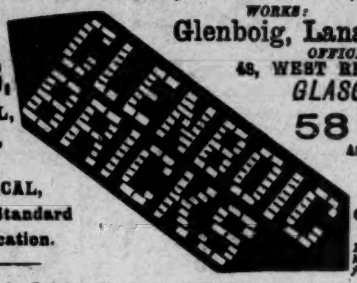

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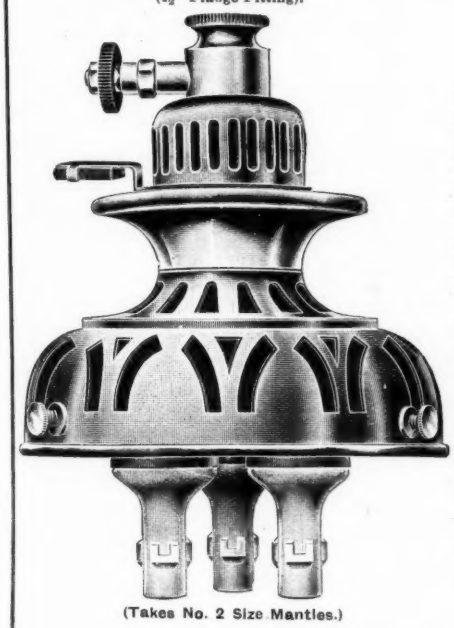

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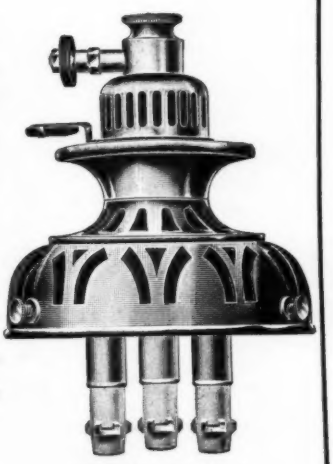

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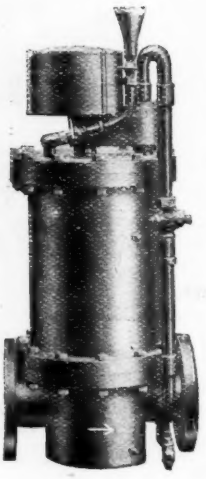

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VOL. CLX., No. 3110.] WEDNESDAY, DECEMBER 20, 1922 [74TH YEAR.

EDITORIAL NOTES.

Opening of the Therm Inquiry.

THE first day's sitting of the Committee appointed by the Board of Trade, with Sir C. G. Hyde as Chairman, was fruitful in interest. The proceedings afford abundant evidence that the Committee intend thoroughly to probe the system of charging for gas on the thermal basis; and this fact alone gives us the fullest confidence as to the result. Equally satisfied are we that the inquiry will have value for the gas industry in stabilizing the therm system in the eyes of the public. But it is noticeable that those newspapers that were a short time since so clamorously demanding a public inquiry, and were devoting much space to vilifying the therm and the suppliers of gas on that system, were strangely sparing in the space devoted to the reporting of the first day's proceedings—this apparently on the ground that the evidence showed too plainly for their liking that the therm and the testing system associated with it are the strongest protectors that the consumers of gas ever had. However, it matters little what those papers do in that respect. All that really matters now is the finding of the Departmental Committee who have been brought into temporary existence by the insistence of objectors whose antagonism is obviously based on sheer ignorance—one cannot say prejudice, because they have confessedly not the knowledge upon which an opinion can be formed. The Committee are desirous of hearing all sides; but they are equally anxious that there shall be finality within a reasonable time to the evidence brought before them; and therefore they have determined the lines of their procedure. On the first day the evidence of the governing authorities was given—the Director of Gas Administration at the Board of Trade (Mr. H. C. Honey) led off; and he was followed by Prof. C. V. Boys, F.R.S., on behalf of the Gas Referees. Evidence is being supplied by the three London Gas Companies; if necessary, some from the provinces will be heard. The railway companies are being invited to represent large consumers; and private consumers may be represented by ratepayers' associations or local authorities, or any representative body in a position to voice the grievances—real or imaginary—of gas consumers. But the Committee will not hear individual consumers. There must be an end to their work; and they have no desire for pandemonium by allowing all individuals who so desire to examine witnesses or to give evidence. It is into the general question that the Committee have to inquire, and not individual complaints. It follows that, if individual consumers are not allowed to give evidence, individuals connected with the gas industry ought not to be permitted to introduce matters extraneous to the question of the "method of charging for gas on the thermal basis"—for instance, questions as to the manufacture of therms, which have no reference whatever to the subject of the system of charging for therms.

Those who have raised objection to the therm system cannot complain of the procedure that has been adopted. They have in point of fact obtained a great advantage by it. It is usual for the plaintiffs or accusers to be heard first; and the case for the defence succeeds. But here the procedure has been reversed, and the strength of the defence of the therm system is being disclosed before the voices are heard of those who have declared the therm to be guilty of misdemeanour in respect of certain consumers' accounts. However, the very fact that the defence is being heard before the complaint may assist in shortening the inquiry; for no one could have followed the plain, conclusive, and obviously impartial evidence of the Director of Gas Administration as to the soundness of the therm system, and of Prof. Boys as to the absolute protection of consumers that the system and the testing prescriptions provide, without coming to the conclusion that the objectors will have some difficulty in putting forward a destructive case. If they were able to do so, and the Committee reported adversely on the system, it would mean an absolute reversal of policy, which would constitute a serious set-back to the technical and commercial progress and the public service of the gas industry. Mr. Honey gives the information in his evidence that some 370 Orders have been issued authorizing the supply of gas on the thermal basis, and about fifty more applications are under consideration. Included in the number of Orders are those granted to twenty local authorities. The Orders issued represent all the important companies, with the result that no less than 90 p.ct. of the whole of the gas supplied by companies in Great Britain is being sold under the new system, and about 10 p.ct. of that distributed by local authorities—an aggregate of some 62 p.ct. of the whole of the gas output of statutory undertakings. This is good progress. But supposing it were all ended now, there is warning in the sound comment of Mr. Honey. As he points out, the new system made it possible to remove from the gas industry the incubus of a standard of quality which left only limited scope for the adoption of new technical processes and improvements in methods of manufacture, and which in practice took no account of the varying circumstances of gas undertakings. The Gas Regulation Act enables the undertakings to work for greater efficiency; greater efficiency means a reduction of the cost per therm; and this is an advantage to the public. This policy has not been seriously challenged by any responsible body; but, without the system of charging on the thermal basis, the difficulty of carrying out the policy would be almost insuperable. The method of charging, as Mr. Honey says, is, in fact, the key to the whole scheme of the Gas Regulation Act; and if it were discontinued, an entirely new policy would have to be formulated. The gas industry does not want to forfeit the right of self-determination in respect of the calorific power to be supplied, nor to go back to the stereotyped condition of having practically a uniform standard throughout the country. The only effect to be expected from that state of things would be largely to neutralize opportunities for progress, which would be disadvantageous to the efficiency of the industry and to the interests of the consumers.

It was, of course, extremely unfortunate that a slump in secondary products and the great coal strike should have synchronized with the adoption of the new system. Those happenings altogether changed the immediate outlook of the industry, and its expected ability to signalize the advent of the therm system by an early reduction of price. But the industry cannot be blamed for effects arising from circumstances beyond its control. The reductions in the price of gas that have been made as disabilities were removed, have proved that, under the heat-unit system, the consumers must benefit equally as by the method of charging by volume—in fact, we firmly believe they stand ultimately to gain more by the system than by any other method. Self-determination of calorific power and the therm basis of charging are inseparable. The dropping of the latter would mean the sacrifice of the former. That is, in fine, the meaning of part of Mr. Honey's evidence. He also spoke of the safeguards that the system provides—the reduction of inerts to the unavoidable limit, and constancy of quality. But, of course, time must be given for the growth of the advantages which the Act is intended to promote. They cannot grow in a night like Jack's beanstalk.

Further, however, as to the safeguards. It was valuable evidence which Prof. Boys gave on this point on behalf of the Gas Referees. His testimony shows that the prescribing body have been very active in doing their part in creating the new system of controlling gas supply; and this more in the interests of the gas consumers than in those of the gas industry, although the latter has not the slightest objection to the form of control that will guarantee that gas undertakings are complying with their obligations. In passing, be it noted that Prof. Boys states that the Gas Referees supported the recommendation that in future charges for gas should be on a thermal basis. Thus we have two disinterested, but competent bodies—the Board of Fuel Research and the Gas Referees—favourable to the change. But the "Daily Mail" disagrees with them! We recommend a study of the evidence, and the tabulated statements put in by the Gas Referees. Already they have issued prescriptions for the systematic testing of 70 p.ct. of the gas supplied by companies in Great Britain. The number of premises or consumers' meters so protected is 2,932,632. The number of testing-places so far prescribed is 211; and, in the quarter ended Sept. 30, the number of testings by the examiners appointed by local authorities was 5616. The number of local authority areas for which gas examiners have been appointed is now 377; and the Referees have abundant evidence that the majority of local authorities regard the appointment of gas examiners for the protection of the consumers as an important specific duty. All this shows how well a system is being established that will raise the standard of protection of the gas consumers throughout the country. There is only one thing temporarily deficient in the machinery; but it is fairly obvious that Prof. Boys believes that in this respect his own labours have scored success. It is the production of a continuously recording calorimeter; and one of the instruments that bears his name will shortly be installed in an official testing place, and be in charge of a gas examiner day by day. In this way an independent practical opinion as to its working will be shortly available.

Reverting to Mr. Honey's evidence, he dealt with the three main objections to the therm system of which he has heard. The principal one, so far as the agitation is concerned, relates to the method of calculation being complicated. A few lessons, however, in an elementary school should get over that trouble. But he considers that the complaint and the difficulty would be overcome by rendering accounts in both cubic feet and therms. In view of the hysterical noise made by the "Daily Mail" as to the therm having inflated gas accounts in a general and alarming manner, perhaps that paper will explain how it is the Gas Light and Coke Company show a consumption last June half year of only 7 p.ct. in excess of that for the corresponding period of 1921; while the average receipts of ordinary consumers merely advanced from £7 11s. 5d. to £7 15s. 1d. This actual state of things, of which the "Daily Mail" had no knowledge before commencing its ignorant campaign, is a finished answer to the widely circulated complaints.

The inquiry was continued on Monday this week, when evidence was given by Dr. C. H. Lander, Deputy-Director of the Fuel Research Board, and by representatives of the London County Council, various organizations, and a few private consumers—the appearance of the last-named being a departure from the procedure rule laid down by the Committee at the previous sitting, and upon which comment is made in the foregoing. Now it transpires that the total number of letters of complaint received by the London County Council was only seventy; but some of them were from Borough Councils, with a few hundred signatures attached in, at any rate, one instance. Just contrast that number, however, with the 1,362,757 consumers supplied by the three Metropolitan Companies at the end of 1921! Furthermore, Mr. C. D. Johnson, the Comptroller of the London County Council, frankly admitted that an inquiry into the gas consumed at a hundred of the Council's schools supplied no reason for supposing that the increase in the amount of the gas bills was due to the change in the basis of charge. There was the Sheffield Gas Consumers' Association, who approve of the therm basis, though not with certain other minor things associated with it. Truly, even the "opposition" are proving the immaculate character of the therm. Little to do with the thermal system of charging, it was suggested by Mr. J. Ollis, the Chief Officer of the Public Control Committee of the Council, that there should be uniformity of quality of gas throughout the Metropolis. Anything of that kind would mean a complete change of policy on the part of the three Companies, and would deprive the administrations of each of them of the unfettered determination as to calorific power with which the Gas Regulation Act invests them. Earlier in the sitting, Dr. Lander had stated that the difference of calorific power in the three supply areas was no disadvantage to the consumers, if their appliances are adjusted to the quality of the gas. Everybody knows that, no matter the calorific power per cubic foot within reasonable limits, if the appliances are adjusted to the calorific power, the efficiency in use will be practically the same. Two points were strongly urged at this sitting—the revision of standard prices, and the rendering of accounts so as to show the volumetric consumption as well as the therm charge. The report of Monday's proceedings is commenced elsewhere in this issue, and will be completed next week. The Committee will not meet again before Jan. 9.

Manufacturing Costs per Therm.

THERE has been much written on the subject of the Tully plant; but the results and conclusions have, generally speaking, been somewhat vitiated by the fact that the plant has been used more or less as an auxiliary to the coal-gas plant, and there has been no complete independence about the results presented. Several engineers who have been in quest of information have complained of the difficulty of getting from the published data exact information as to thermal efficiency and costs of production using the Tully plant alone. In a paper that Mr. N. Sampson Smith, of Ossett, read before the Yorkshire Junior Gas Association last Saturday, this want has been largely filled. Though Mr. Smith will not pledge himself that in every detail there has been absolute precision, yet he submits that the results may be taken as representing a fair degree of accuracy under working conditions. We know that this is so within the limits of opportunity. The fuel used in the plant was carefully weighed; and the gas was measured into a holder. The fuel, however, for the steam required had to be calculated. So had the calorific value of the gas, from analyses; but the figures presented in this respect are averages of a large number of complete analyses. The calorific value of the fuel was obtained by determinations in the bomb calorimeter. The Tully plant at Ossett has a specified capacity of 300,000 c.ft.

We will pass over the general parts of the paper with the one remark that we agree with Mr. Smith in the expression of his belief that the subject of complete gasification will be one of fundamental importance in future, and that it holds much in store in connection with the production of therms at low cost—not that *at the present time, under certain conditions*, the Tully plant can show any substantial superiority in the bare manufacturing cost per therm compared with certain other modern systems. But it should be pointed out that Mr. Smith did not deal with the matter comparatively as between different types of plant; he confined comparison to the use of different fuels in the Tully plant. But the point as to complete gasification being of fundamental importance in regard to the future permits of the use for comparison of Mr. Smith's figures, as obtained within the working limits of the Ossett plant. First of all, however, let us take the costs per therm as presented in the paper for different mixtures of fuel. The details can be gathered from the "Table of Results." Using coke alone in the plant, the cost per therm works-out to 2·99d.; with intermittent working, with 20 p.ct. of coal and 80 p.ct. of coke, the cost per therm is practically the same—2·98d. Gasifying 50 p.ct. of coke and 50 p.ct. of coal, the cost per therm was 2·29d.; and using all coal, 2·05d. This shows that under the conditions of fuel costs at Ossett, the cheaper therm is produced by using all coal in the Tully plant; the half-and-half working coming out next. But one thing is not quite clear from the data as presented; and it is that one cannot gather whether in the fuel costs a deduction has been made for the tar in the two latter cases. The lowest cost per therm, it will be seen, is with all coal 2·05d., though in this case the thermal efficiency of gas production is slightly less than with half coke and half coal gasification—43·2 p.ct. compared with 45·6 p.ct. The lowest cost is the one to compare with other types of plant; and it is remarked that at Ossett the cost per therm, with Goodall-Clayton intermittent vertical retorts, is 2·04d., which

compares with the 2·05d. for all-coal working in the Tully plant. Therefore, at the time and in the circumstances, there was nothing much to choose between the two plants on the basis of manufacturing cost per therm.

It is very important that in all these cases full information should be given as to local costs, because otherwise manufacturing costs per therm in one town cannot be safely contrasted with those in another town, nor can the manufacturing costs per therm with one plant be safely compared with another. Getting down to Portsmouth, with its long-distance transport costs for coal, the paper by Mr. Thomas Carmichael (published on Nov. 29) shows that, with his new continuous vertical retorts and steaming, the total cost per therm is 2·22d. on test results, and 2·24d. on actual working. This brings us to another point; and it is that, in these comparisons of manufacturing costs per therm, to be strictly accurate, the capital charges for the respective plants should be included, in view of considerable difference in the initial capital expenditure upon them in relation to therm-producing capacity. Another point is that the movements of the secondary products markets have little concern for the complete gasification plant, but they have for other types of plant. Therefore, when markets are reasonably good for secondary products, Portsmouth with its long-distance transport charges, and continuous verticals with steaming, can get as close as 0·2d. in manufacturing cost per therm to Ossett and complete gasification. But with the development of the gas business, and the increased output of secondary products that would result from the whole of the plant continuing on bye-product lines, complete gasification will probably have a progressive application as an auxiliary for making more therms per ton of coal instead of considerably adding to the output of secondary products; so assisting to keep a reasonable balance between the supply of, and the demand for, the latter—much in the same way as in some areas water-gas plant is doing to-day in respect of coke. Though the cost of water gas may be per therm somewhat in excess of coal gas at the present time, the value of reducing in this way the available quantity of coke for sale is reflected in the revenue per ton for it. Anyway, from what has been said, it is clear that times and local circumstances alter the respective places and claims of different types of gas-producing plant. To be too dogmatic as to the plant that will consistently produce the cheapest therm, is somewhat dangerous. Therefore, assembling all considerations, perhaps a little qualification of the latter part of a passage in Mr. Smith's paper would be advisable. That passage is: "It cannot be doubted that great relative reductions can "still be made in the rates at which heat units are sold to "the public; and perhaps the most important item among "numerous others will be found in delivering the maxi-"mum possible proportion of the total heat of the coal carbo-"nized into the station holders."

Agriculture and Sulphate of Ammonia.

THE condition of agriculture in this country has been under serious discussion in the House of Commons, and in this the ex-Premier, Mr. Lloyd George, has taken prominent part. One result is that the Government are proposing to set up a Committee of Investigation, composed of three economists connected with agriculture, to inquire into the methods which have been adopted in other countries (including the Dominions), during the past fifty years, to increase the prosperity of agriculture, and to secure the fullest possible use of the land for the production of food, and the employment of labour at a living wage. The Committee are also to advise as to the methods by which these results could be achieved in this country. When the announcement was made as to the terms of reference, Mr. Bonar Law was asked why economists had been appointed. His reply was that there had been many commissions of men who understood something about the land. But the idea now was to get the inquiry away entirely from interested people, whether from the point of view of money or of property. There is something in this, perhaps in more senses than one. Experience shows that many men trained in any particular direction are so often wedded to custom that they are the most difficult to persuade to make any departure to new ideas. On the other hand, economists are within limits all right as investigators of statistics and problems; but, if they have no practical experience to combine with theoretical knowledge of the subject, they may go vastly astray in their findings.

However, it is to be hoped that the Committee of economists will not have their survey confined to other countries and the Dominions, but will provide an opportunity to hear technical men with a knowledge of the use of fertilizing agents in securing "the fullest possible use of the land for the production of food." The importance of sulphate of ammonia for this purpose was experienced during the war; and then, and for some time subsequently, the farmers were doing extraordinarily well. But since, their financial lot has not been the most fortunate. It will be remembered by those who read the recent report of the British Sulphate of Ammonia Federation, Ltd., and the speech of the Chairman (Mr. D. Milne Watson) at the annual meeting of the members, that the administration of that body, in framing their policy last year, took into serious account the economic condition of the farmers, and fixed the prices of sulphate somewhat below those that might otherwise have been obtained. This was diplomatic for various reasons—one being the competitive outlook for bye-product sulphate of ammonia, which suggests that the greater the stability that the commodity can be given among British farmers, the better for its future. The report of the Federation indicated that there is plenty of scope for increasing the application of sulphate to the land at home. We are far behind Germany in the quantity of pure nitrogen used per acre. A tabulated statement in the report shows that the average actual consumption of pure nitrogen in Great Britain and Ireland was 4·53 lbs., while Germany is using 10·3 lbs.—the possible consumption in both cases being 12 lbs. There we have room for development in education and use among British farmers; and this is work upon which the Federation are engaged. It is a matter that should be, and no doubt will be, brought before the Government Committee.

In increasing the use of artificial fertilizers, agricultural education and research will go far. Sir Robert Sanders, the Minister of Agriculture, was speaking the other day at a meeting of the Council of Agriculture for Wales; and he reminded the members that a sum of £850,000 was provided by the Corn Production Repeal Act for the development of the schemes of agricultural education and research promoted by the Ministry. The Chancellor of the Exchequer has authorized the statement that that sum is to be expended during the five years to March, 1927, as an addition to the sum that was previously being spent on education and research. The schemes started out of the £850,000 will also involve a continuing charge for maintenance after 1927, though the Ministry will endeavour to reduce the continuing charge to the minimum. It is clear, as Sir Robert said, that though it is not possible for the Government to put before agriculturists heroic measures or promises, they are prepared to do their best within the limits of their powers.

The Miners' Conditions.

NICE things are being said about the coal miners for the way they have been working lately, as tested by the weekly output, which is not a thoroughly sound basis. Much sympathy is being expressed for them on account of low pay; but the sympathy, if at all, should be reserved for those who are being low paid, and not be distributed generally among the miners without distinction. The miners' leaders are painting, in and out of Parliament, a very gloomy picture of the miners' conditions, for the purpose of getting something more material than sympathy from the Government, though there is ample proof that, taking the industry throughout, there is to-day less unemployment in it, and less poor pay, than in some of our other large industries. The representatives of the miners in the Labour Party in the House the other evening had full opportunity to say all they could with the view of moving the House and the Government to do something special for the miners, which could not be done for the mass of unemployed and short-time workers of other industries, without gradually sending the country, with its existing enormous financial obligations (including about £100,000,000 a year for unemployment pay), into a state of bankruptcy.

The occasion was the second reading of the Consolidation Fund (Appropriation) Bill. Mr. Walsh opened for the miners. He, as well as other members, called attention to the amount of unemployment there is in the mining industry. There is, as a matter of fact, less in it than there is in certain other industries; and what is more, there are some 5000 more workers in the industry than there were in 1913. This fact is worth remembering when considering the question of output. It has been brought about by the

fact, and so therefore has the extent (such as it is) of unemployment, by the influx of workers to the industry during the war, with no corresponding efflux when the war was over and the miners returned to their old work. The miners' representatives speak in averages when making comparison of wages earned. The total amount paid in wages and salaries in 1914 averaged 6s. 5½d. per day; now the average is 9s. 1d. per day, or about 41 p.ct. increase, while the cost of living is about 80 p.ct. above that for 1914. If the average wages showed an increase of 80 p.ct., it would be 11s. 7½d. per day. But the 9s. 1d. is the average of all classes of workers; and all classes of workers in and about the mines are not paid 9s. 1d. per day. The average hides the facts as to good payment. Furthermore, be it remembered that the figure is spread over a number of workers 5000 greater than before the war, with a reduced average output of coal per man or per day. These things are worth noting; because they show that matters are not exactly as represented by the miners' leaders. It is the unskilled men who are feeling the pinch; but the leaders are not emphatically saying so.

There comes the important point as to output. The Prime Minister and many others say the miners have worked well, as is shown by the fact that the weekly output, under the seven-hour system, has latterly nearly reached the level of what it was in 1913, when the eight-hour system obtained. Weekly output is an unreliable test when it is remembered that more workers are now employed, and that the higher weeks' outputs are the results of short spells of good work. This is where the test of averages is informative. In 1913, the output of coal, with 5000 less workers, was 287·4 million tons; it is calculated that the output is now at the rate of 264 million tons a year—a difference of about 23½ millions, which is important when one has regard to the effect on production costs of reduced output and of a greater number of workers. Taking the annual output of 1913, it averaged per worker 259 tons a year, or on a fifty-week year 5·18 tons per week. An output of 264 millions, with the present number of workers, is equal to 236 tons (or thereabouts) per worker per year, or 4·73 tons per week. There we have about 0·45 ton less production per worker per week, or approximately 23 tons less a year per worker; and on the total number of workers employed, this means about 23½ million tons less than in 1913. This is a serious difference when the increased number of people employed is considered; and there is nothing to which the reduction can be traced other than the seven-hour day in place of the eight. The two factors—increase in the number of workers, and reduced output—bring their combined weight to bear upon the costs of production. If as much coal could be produced in seven hours as in eight, with the increase that should obtain from the extra men employed, the miners would to-day be enjoying something additional to the amount they are now earning. In view of these statistical facts, one cannot join with any particular enthusiasm in the praise which has been handed-out as to the total weekly output of the miners now employed.

In the House, Mr. Ramsay Macdonald, the leader of the Labour Party, asked for an inquiry into the conditions of the mining industry, from the granting of which request the Prime Minister could not see that any good would accrue, which would ameliorate what the miners' representatives claim is a present pressing necessity. Mr. Bonar Law looks for more help coming from a revival of industry generally; and he is absolutely convinced that, unless some great disaster befalls, we are going to have better trade before long. The turn of the industrial tide has already come. But, if and when the tide reaches high water mark, what will be the effect of having available 23½ million tons of coal less a year—perhaps more, if the rate of output of the last few weeks is not maintained? There is serious danger in that lower output. If the miners have any suggestions to make to the owners for the improvement of the conditions of the industry, a round-table conference will answer all purposes, rather than a long formal inquiry. One suggestion they might make would be a reversion to the eight-hour day. The chances, however, are not great that they will ever do this, even to improve their own fortunes. Yet the miners' leaders asked for preferential treatment for the men, and a subsidy from the pockets of the ratepayers. We fail to see the logic of this with so many men in worse case in other industries, to which no good has been done by the three months' coal stoppage last year, and the past and present high cost of coal.

A Christmas Greeting.

With all heartiness, we express the good old wish to our readers and their families:

"A MERRY CHRISTMAS, AND A FULL MEASURE OF HAPPINESS."

Parliament.

Parliament was prorogued last Friday until Feb. 13. The new session is not likely to produce anything of immediate concern to the gas industry; but it is hoped that the policy pursued by the Government will be generally helpful in the recuperation of industry.

Reduction of Gas-Oil Price.

The "Petroleum Times" reports that the official price of gas-oil has been reduced by ¾d. per gallon—making it 4½d., net and naked, *ex*-wharf. There was a notable reduction in the import of gas-oil last month; the quantity being only 768,839 gallons, compared with 6,233,798 gallons in November, 1921. The total for the first eleven months also shows a decline, in comparison with the corresponding period of last year.

Small Gas Undertakings and Technical Control.

In the view of the managements of some small gas undertakings, the Gas Regulation Act and the therm system require too high an efficiency on their part; and this is regarded as unfair. Mr. H. C. Honey referred to this in his evidence before the Departmental Committee on the question of charging by the therm. But as he intimated, it is the deliberate intention of the Gas Regulation Act to increase the efficiency of gas supply; and therefore the gas industry must find means, by amalgamation or joint control, or by some other method of pooling resources, to increase the efficiency of those gas undertakings, which, standing alone, cannot afford the technical advice and supervision which are available in the case of the larger undertakings. The National Gas Council not long ago were making suggestions in this direction.

Gas Coal Exports.

The total quantity of coal of all kinds exported last month was 6,570,758 tons, with a value attached of £7,433,280. The amount in November, 1921, was 3,593,864 tons, and in November, 1920, 1,360,724 tons. The gas coal shipments were nearly double the quantity for November, 1921; the figure being 902,028 tons, compared with 454,086 tons. In November, 1920, the quantity was 160,339 tons. The value attached to the 902,028 tons last month was £994,980, or £1 2s. 0·7d., compared with £1 7s. 4d. in November, 1921. In the eleven months, the amount of gas coal shipped has reached the enormous quantity of 8,438,058 tons, which means that by the end of the year the exports will reach about half the tonnage used for gas making in Great Britain and Ireland. The value of the 8,438,058 tons is £9,274,004. In the corresponding eleven months of 1921, 3,065,151 tons of gas coal were exported; and in 1920, 1,911,580 tons. The increase is good testimony to the preference for British coals for gas making.

An Indication of Trade Improvement.

An excellent indication of the nascent improvement of trade is furnished by the iron and steel industry. The National Federation of Iron and Steel Manufacturers report that the production of pig iron in November amounted to 493,900 tons, and of steel ingots and castings to 600,800 tons. In the case both of pig iron and of steel, this is the highest total attained since the coal stoppage of 1921. In the case of pig iron, however, production is still only 57 p.ct. of the average monthly output of 1913. Regarding the general question of the improvement of trade, the retiring President of the Federation of British Industries (Col. Armstrong), in his address at the annual general meeting, said that in some measure justification could be found for the belief that things are improving; but he indicated that we must not be too optimistic concerning any immediate substantial amelioration. But after all he had to say to damp optimism, he wound-up in a pleasant key. "If," he said, "we conserve our assets and work together,

the time is not far distant when we would again find ourselves approximating to our pre-war volume of trade and a national balance-sheet showing a satisfactory surplus of production over consumption."

Gas Coal Position.

The scarcity of best-class gas-coals continued in Durham; and this is likely to hold until the close of the year. There is a little more openness in the second-class varieties, but still there is not a large available selection. Prices are maintained at recent figures; but there may be some easing-off in the New Year. The suggestions as to this, however, appear to be purely speculative. From other fields the reports as to the gas-coal business is satisfactory, particularly in Yorkshire, where the demand for export has been growing fairly considerably. From that quarter, and from Nottinghamshire and Derbyshire, comes information as to pressure for supplies in view of the holiday season.

Gas Coke Exports.

In November, 115,680 tons of gas coke were exported, the value being £159,023, or within a fraction of a penny of £1 7s. 6d. per ton. The amount exported in November, 1921, was 63,392 tons; and in November, 1920, 20,060 tons. In the eleven months, 816,322 tons were shipped, with a value attached of £1,154,000. In the corresponding period of 1921, 391,189 tons were exported, of a value of £833,183. In the same period of 1920, 696,094 tons were sent abroad; the value being £4,307,799!

Sulphate of Ammonia.

Business abroad in sulphate of ammonia last month was good. The quantity dispatched from this country was 14,058 tons, as against 7408 tons in November, 1921. The exports for the eleven months totalled 127,338 tons, as compared with 116,115 tons in the corresponding period of 1921. Thus the increase to the end of November this year has been 11,223 tons.

Trade Union Amalgamations.

During the last few years, there has been a considerable consolidation of trade unions by amalgamation. In 1920, for instance, nineteen unions disappeared from the register owing to this cause, and fifteen the year before. The chief example was the amalgamation of seven unions with the Amalgamated Engineering Union. Now we read that thirty-five unions in the metal trades have been invited to send delegates to a conference in February to discuss the possibilities of amalgamation. The organizations include the Amalgamated Engineering Union; and it is expected the total membership represented on the occasion will be upwards of 700,000. Fifteen of the textile unions, apart from the cotton operatives, have also been invited to a conference in February to discuss amalgamation. The aggregate membership which will then be represented, it is expected, will reach 160,000. On the other hand, the branches of the National Union of Railwaymen have voted against the proposed affiliation of their organization to the Transport Workers' Federation. The adverse majority is described as "relatively small." A proposal is now *sur le tapis* for creating a Standing Joint Committee of the National Union of Railwaymen, the Locomotive Men's Society, and the Railway Clerks' Association. These are signs of the times in the labour world.

Birmingham Industrial Research Laboratory.—A party of fifty consisting of engineers and technologists—members of the Institution of Mechanical Engineers, Graduate Section—paid a visit last Saturday afternoon to the Industrial Research Laboratory, &c., of the Birmingham Gas Department. Interesting developments have recently been made, including new demonstration rooms; and it is proposed shortly to instal in the main physical testing laboratory at the Council House a 100-ton vertical Avery testing machine. The latter will be used for the larger and heavier tests of concrete and steel structures for the various departments of the Birmingham Corporation and the manufacturers of that city and district. The party were conducted over the various departments by Dr. C. M. Walter (Engineer-in-Charge) and Mr. V. E. Green (Assistant Engineer). The visitors were much impressed by their visit; and due acknowledgment was made to the Gas Committee for their hospitality and the facilities they had provided, and to the departmental heads for their consideration.

PERSONAL.

In view of his appointment as Engineer and General Manager to the Stretford and District Gas Board, Mr. W. M. CARR is, of course, vacating the position he at present holds as Engineer and Manager to the Ormskirk and District Gas and Electricity Company; and from Jan. 1 next his services to the Ormskirk Company will cease except in an advisory capacity. Mr. F. S. HUNTER, who has acted as his assistant for the past nine years, has been appointed to succeed him as Engineer and Manager to the Company. Mr. Hunter, who has been associated with Mr. Carr during the entire reconstruction of the works, was in charge of the business of the Company during the period of the war, while Mr. Carr was serving with the forces, and he has also assisted Mr. Carr since the war in connection with his practice as consulting engineer.

Many in the gas industry will remember Sir JAMES BELL when he was Town Clerk of Leicester, and the great interest he took in matters connected with the Corporation gas undertaking; and they will heartily congratulate him upon the recognition of his good work in London. At last Thursday's meeting of the City Corporation Sir James Bell, who is Town Clerk, was presented with an emblazoned address of thanks by the Lord Mayor for the signal services rendered by him through a period of stress and anxiety brought on by the war, when his courage, tenacity of purpose, and farseeing ability materially assisted in the framing of a policy which had enabled the Corporation so to adjust itself to the requirements of to-day as to give good grounds for believing that its present and future equipment for public service would not be unworthy of its meritorious past.

Bro. JOHN W. STURDY, Manager of the Easingwold (Yorks.) Gas-Works, was last week installed as Worshipful Master of the Falcon Lodge (No. 1416), Thirsk. Several Brethren associated with the gas profession supported him on the occasion; and the whole proceedings were of the highest Masonic order.

OBITUARY.

Messrs. W. & B. Cowan regret to notify the death of their North of England representative, Mr. ARCHIBALD MACLEAN, which took place on Sunday, the 10th inst., at Newcastle-on-Tyne.

ELECTRICITY SUPPLY MEMORANDA.

SOME of the men in the electricity supply industry are prone to accept an experience in one place as having unquestionable application in another. They pay little heed to the effects that different conditions have upon results. We get an instance of this in the discussion of the paper by Mr. W. A. Gillott (which was noticed in the "Memoranda" last week), when the author brought it from Newcastle to London, and read it before the Institution of Electrical Engineers. In the course of the paper, one point that was not referred to by us last week was the experience related by Mr. Gillott of the use for domestic purposes of current on the Billingham Housing Estate. Only twenty-five houses are concerned. These are occupied by the Supply Company's own workpeople, who have electricity at a cheap rate. These people must all know something about electricity, and so are not ordinary users. We have no doubt, too, that their appliances are well cared-for, and so maintained in a good state of efficiency. The houses, we see, are each fitted with a cooker, a 10-gallon wash-boiler, one electric fire, a kettle or iron, and the lighting. An average of 11·28 KW. is installed in each house; the total connected load therefore being 282 KW. The average maximum demand is 24 KW.; and curves which the author presented show that the load is primarily a daylight one. He admitted that some small undertakings could not at present handle a big demand for cooking and heating; but even a moderate cooking demand is only built up gradually. The point that the load here is primarily a daylight one is interesting; but it is a feature that has no universal application. Some electrical engineers seem to think that this experience is highly satisfactory proof that the domestic uses described will not affect them, in other places, at the peak of the load—that is to say, during lighting hours. Mr. L. L. Robinson, of Hackney, is one of these. In the discussion, he said there had been fear that the cooking and heating demand would force-up the maximum load on the works to a dangerous extent; and he thought that the Billingham curves would relieve the minds of many engineers with regard to this, for "they proved conclusively that the load did not come upon the usual lighting peak." One must not jump at conclusions in that fashion. The habits and daily feeding programme of the Billingham electricity employees may not—and are not—representative of those of the people in a good many other districts. What the curves, if anything, do show is that working-class people who can have their meals at home would, if their cooking consumption was fairly considerable, form, from the point of view of generation, the best of patrons—because of the daylight

Daylight Domestic Heating Preferable.

use of the current. But it is the poor people who have their dinners at middle day who can least of all afford the costs of electric ovens, installation, and so forth, and at the same time pay expensively for B.Th.U. Cooking and heating in most residential districts are required during the lighting hours of winter; and it is during those hours that electricity concerns cannot, if they act fairly to the lighting consumers, afford to supply energy for other purposes at low rates. Mr. A. C. Cramb, of Croydon, is a subscriber to the electrical belief that the cooking load is going to be a good one—some day; but he agrees that electrical engineers are up against trouble with regard to the mains.

Consumers and Complicated Tariffs.

Some interesting points were made in the course of the discussion, in regard to tariffs. It will be remembered that Mr. Gillott advocated the bi-part tariff as a means that will assist in the development of domestic electrification. But Mr. Cramb stated that the author's suggestion was on the lines adopted recently by the Croydon Town Council. Particulars were sent out to the consumers; but the response was very small. Searching through their register of consumers, it was found that about 1200 stood to gain something by adopting the system; but in the result only about 150 took the trouble even to reply. If, he added, anything was suggested outside a flat rate, the electricity suppliers were accused of playing the therm "dodge." That is not a nice word; we should like Mr. Cramb to enlarge upon it, and explain what he means by the therm "dodge." It suggests something fraudulent or deceptive, instead of being protective to the consumers in ensuring that they get full value for their money. Electrical men devoutly wish they were in the position to sell as much thermal value for a given sum as the gas undertakings. But unfortunately for them they are not. Mr. Robinson agreed that the two-part tariff was in the right direction. But the secondary rates charged are, in his opinion, a great deal too high for the electrical "whole-hogger." The electricity people have had unkind things to say about the therm. They do not like it. It carries home the fact that for heating purposes they cannot give the same value for money as gas suppliers. Mr. Cramb, as we have seen, with refined courtesy, calls the therm a "dodge"; and we have noticed that it has been stated by other electrical men that the public will never be able to understand the therm. Perhaps the understanding will not be such a great strain on them as the comprehension of electrical units. Mr. Robinson declared that he has nothing good to say of the tariffs of some of the London electricity undertakings, which require a mathematician to explain to the consumer what he has to pay. How is that in comparison with the allegations as to the therm? There were one or two speakers who tried to make the truth heard. One of them was Mr. Thorrowgood, who said he was brought up against "actualities" by the electrical bill at the end of the quarter. And Mr. P. M. Baker, fearfully bold, declared that it was still cheaper to cook by gas or coal than by electricity. He had "Noes" hurled at him from all parts of the hall; and he hastened to explain that electrical appliances were improperly used. Of course they are. It is never the dearness of heat the electrical way, combined with the high costs of appliances and installation!

Dual Supplies and Housing Schemes.

The Exeter City Council and the electrical papers have been much exercised over the question of whether or not the Buddle Lane housing scheme should have a supply of electricity for lighting purposes. With gas for a cooker and a wash-boiler, this would mean a dual system of supply; and dual systems of supply are very expensive things. But some councillors do not care a rap about expense. It is rather a good thing for Exeter that the Ministry of Health has a controlling voice. The facts are simply these: The Gas Company's installation offer for all requirements was £3 10s. per house; for electric lighting only, the Electricity Department quoted from £4 4s. to £5 per house, to which latter £2 10s. would have to be added for the cooker and wash-boiler. Adding the £2 10s. to the £4 4s. for electric lighting, the result is £3 4s. per house above the Gas Company's offer. In other words, the cost becomes nearly double. That is what results from proposing to give such houses a dual supply for different purposes, while one supply would answer for all. The opponents of the all-gas scheme, who were the champions of the electricity undertaking, casting all economy to the winds, made all sorts of random charges. They seemed, among other things, to insinuate that the gas shareholders on the Council were influencing the matter; but the fact was that the Committee concerned had been entirely influenced by the £ *s. d.* of the matter, and by the Ministry of Health, who had ruled-out electricity on account of the additional cost which would be entailed. There are two things that stand to the credit of the Gas Company, in addition to the economy that they were able to show. Both points were acknowledged by Mr. Widgery, the Chairman of the Housing Committee, during the discussions in the Council. One is that the Company acted in a very public-spirited way by coming to the rescue of the Council when dealing with the Polsole Bridge site; and the other is that, in connection with the later scheme, the Company were willing to bear the cost of extending the main to the houses, but this was on the understanding that the lighting was given to them as well. This was only fair; for without all the business that could be secured, the Company could not be expected to incur a large additional capital outlay, for merely the intermittent day consumption with cookers and wash-boilers such as the houses would provide. Some members of the City Council were under the impression that they could compel the Company to supply gas for cookers and wash-boilers. Evidently they are not aware of the section of the Gas-Works Clauses Act, 1871, which provides that "the undertakers shall, upon being required so to do by the owner or occupier of any premises situate within twenty-five yards from any main of the undertakers, or such other distance as may be prescribed [in a Special Act], give, and continue to give, a supply of gas for such premises," &c. However, on the occasion of the last discussion, it was decided that the Housing and Electricity Committees should confer as to the desirability of using electricity in the houses, and for public lighting in the neighbouring thoroughfare. That is the position. During their consultations, on the wall of the room the statement made at a recent meeting of the Council should be given prominence: "The Council are already incurring a loss of £8500 a year on their houses."

Prizes to Help Progress!

The "Electrician" has come to a conclusion on a point of policy; and it is that the electricity industry requires the application of a little stimulant to assist it to progress. The stimulant takes the form of £250, which it is proposed to distribute as prizes among the successful ones taking part in a competition. A big industry like that of gas or electricity, with so many men in them investigating and working upon improvements, does not as a rule need anything in the way of stimulant of this character. It always seems to us that it is rather *infra dig.* on the part of an industry to indulge in a method of encouraging suggestions for progress that appeals more to children than to adults. However, this is the proposal: The competitions will be open to all persons without distinction of age, sex, or nationality, and will be held at quarterly intervals during 1923. The first will be for designs for the cheapest and best electrical installation for an all-electric house. Of course, the "best" cannot be the "cheapest." The second will call for a solution of the problem of how hot water can best be obtained electrically. The third will require a scheme to be prepared for the lighting of a village hall electrically. It is anticipated that the results will stimulate electrical progress, and lead to the cheaper and more efficient use of electricity.

Failures and Silence.

The electrical people are pleased to talk of electricity being now so reliable that a cessation of supply is a matter that can be dismissed as quite improbable, if not practically impossible. But, of course, this is mere pretence. Breakdowns occur just as they did formerly, though it is true there is less notice taken of them in the newspapers. The fact is they are now looked upon as a weakness common to electricity supply. Therefore the interest in them is dying down, excepting among the users where they occur, and then and there expressions regarding them are more forcible than polite. When these things happen in a household where trust has been put in an electric oven, and a dinner is spoilt, we can picture the irritation of the entire household, and the flood of anathema that results. But as we were saying, these occurrences are not so frequently reported as formerly in the papers. A member of the "JOURNAL" staff was at East Boscombe towards the end of November; and one evening about 5.15 the electric light collapsed. The humble candle, with its small flickering light, is the faithful auxiliary of the electricity industry; and those East Boscombe shops that are ordinarily illuminated electrically, that evening looked strangely weird and out of it by candle light in comparison with the shops that were brilliantly illuminated by the more stedfast incandescent gas-light. Another member of the staff was at Surbiton one evening about a fortnight ago; and there was a failure there for fully an hour. Other interruptions of supply have been lately noticed in our news columns. But these two incidents remind us that the number of these failures cannot be gauged by the newspaper reports.

Electricity Bills in Parliament.

Relatively few Electricity Supply Bills are to be promoted in Parliament next session. The number of notices is below the average. Possibly the work of the Electricity Commissioners has something to do with this. The Oakham Gas Company are seeking electricity supply powers; and the Swanage Gas Company are looking for authority to acquire the local electricity supply undertaking. Three or four municipal authorities are seeking to supplement their existing powers, but by nothing out of the ordinary. The Torquay Corporation are proposing to increase the charges for electricity supply. The Morley Corporation are contemplating power to impose penalties on persons hindering officials from inspecting premises supplied with electricity, and to limit the maximum electric power which a consumer shall be entitled to demand. The London Electricity Joint Committee (1920), Ltd., are proposing to provide for the improvement of the generation and supply of electricity in those parts of the Administrative County of London now supplied by company undertakings and in adjacent districts; to secure authorization to take leases of generating stations, and main transmission lines; to supply electricity in bulk; and to authorize the Central Electric Supply Company to transfer their undertaking to the Company. There are also a number of joint electricity supply and traction Bills.

BRITISH COMMERCIAL GAS SALESMEN'S CIRCLE.

Southern District—London Area.

A crowded first meeting of the Circle was held on Monday last, at the Society of Arts, Adelphi—Mr. F. W. GOODENOUGH in the chair.

The rules that have been adopted for the conduct of the Circle were read; and it was stated that meetings will be held on the third Tuesday of every month, except during the summer months.

The CHAIRMAN then delivered an address on "Service." He remarked at the outset that he was not going to talk upon any specific aspect of salesmanship, because it seemed to him that, in starting the work of a circle such as this, it was important first of all to discuss principles. Salesmanship must necessarily depend upon the policy adopted by the undertaking; and the policy must be founded upon right principles, if it was to be right, and if the salesmanship that had the carrying-out of the policy was also to be right. So he had chosen the fundamental subject of "Service." This he dealt with fully, and in a manner which obviously appealed to his audience.

A discussion followed, in which some practical points were brought out. The Chairman was heartily thanked for presiding; and it was announced that the subject to be discussed at the next meeting would be "Disputes." It was generally agreed that this first meeting had been a great success.

A fuller account of the proceedings will appear in next week's issue of the "Gas Salesman."

ASSOCIATION OF GAS SALESMEN

(NORTHERN AREA).

A successful meeting of the Association was held, under the auspices of the "B.C.G.A.," on Wednesday, Dec. 6, at the offices of the York Gas Company, with Mr. A. B. Roxburgh (Newcastle) in the chair. The members were welcomed by Mr. H. E. Bloor.

The Chairman gave an address on "The Character of the Individual as Applied to Salesmanship," in which he enumerated the qualities that a salesman should possess—placing first that of patience. His remarks were much appreciated.

Mr. F. Millner (Scarborough) followed with a paper on "How to Organize a Water-Heating Campaign;" and then Mr. G. Perkins (Hull) opened a discussion on "Points I am Guided by When Purchasing Gas Apparatus for Sale or Hire." Both contained practical hints, which salesmen will find useful.

The proceedings will be fully reported in the issue of the "Gas Salesman" which will appear next week.

"Who's Who in Engineering."

In greatly enlarged form, the third edition has appeared of "Who's Who in Engineering," the Editor of which—Mr. John Ed. Sears, Jr., C.B.E., M.A., M.Inst.Mech.E., F.Inst.P., Assoc.M.Inst.C.E.—is to be complimented upon the amount of work he has put into the book. The largely increased number of notices to be found in the new edition have nearly all been contributed by the subjects of them, so that there can be no doubt about the reliability of the information contained in them. When noticing the previous edition, it was remarked that the Editor did not claim to have reached finality in the big undertaking to which he had set himself; and doubtless in future years he will improve upon over 8000 notices which are to be found in the present issue. Thus with each edition we may expect the usefulness of the book to be increased—and it is, of course, already very valuable as a work of reference. The list includes representative British engineers in all parts of the world, and also a few eminent foreign engineers who are members of the leading British Engineering Institutions. The book is divided into two parts, representing the professional and producing sides of engineering respectively. There has, too, been included in the present edition certain information not ordinarily accessible in engineering reference books; and it is rightly thought that the new features—current engineering topics, British engineering standard specifications, legal notes, &c.—should appreciably enhance the general utility of the publication. There is a classified register of engineers; and in this it is noticed that the list of gas and gas-works engineers included is now reaching good representation. The Editor will doubtless be glad to receive others. There is a section devoted to centres of technical engineering training. The book is published by the Compendium Publishing Company, of Nos. 93 and 94, Chancery Lane, London, W.C., the price being 28s., plus 1s. 3d. postage in the United Kingdom—abroad extra.

Mr. Herman Russell says that though a pound of anthracite has in it round about 14,000 heat units, when burned, it is difficult to obtain more than about 300,000 heat units for a dollar. A gas that would yield 550 B.Th.U. per c.ft., sold for a dollar, would, if burned in a furnace 66 p.ct. efficient, give the consumer 366,000 heat units for his dollar. While it is difficult, he adds, to construct a furnace which would utilize more than 20 p.ct. of the potential value of coal for actual heating purposes, gas-furnaces have been developed which are 70 p.ct. efficient.

ELEMENTARY INTERNAL COMBUSTION ENGINES.*

Reviewed by W. A. TOOKEY, M.I.Mech.E.

THE author is Senior Lecturer in Mechanical Engineering at the University of Sheffield; and this fact probably explains why the book has been given the title "Elementary Internal Combustion Engines." Evidently it has been prepared mainly for the instruction of students in technical colleges, as from this point of view only can it be called elementary. Indeed, in the last chapter, on "Engine Efficiency," and particularly in the last two pages, are numerous algebraical equations, including chemical symbols, which at first sight appear to be anything but elementary.

The book itself is somewhat disappointing, as while there is a crying need for a book upon gas-engines written in a simple style, and without going into thermo-dynamics or anything of that sort, Mr. Kershaw's book is academical, and embodies little practical experience. With regard to oil-engines, in the latter part of the book, most of the descriptions are taken from manufacturers' publications or from articles in the Technical Press. This also is noticeable in the portion of the book set apart for the description of gas producers. For example, the design of the Crossley suction-gas producer described and illustrated in the book is not only entirely out-of-date, but has long ago been superseded by the open-hearth producer, of which no mention is made.

As far as the readers of the "JOURNAL" are concerned, they will particularly want to know what the book is like with respect to town-gas engines. Here, again, though this is the second edition of the book, the quality of the contents is very disappointing. The phrasing is certainly elementary, and it is not always certain what the author means to say—as, for example, when he mentions "the first cost of large gas-engines is rather high, and there is a rather heavy expense charge." Fault could also be found with the author's logic; for in the very next paragraph he states that "in all cases where fuel is expensive and economy of the first importance, the internal combustion engine is superior to the steam-engine; it is particularly useful and economical for small powers, for which it has largely superseded steam-engines." One would have thought that the useful and economical advantages of gas-engines would have been just as noticeable in the larger powers, for then the economy (which is undoubted) is so much the more evident.

Without wishing to be hypercritical, one cannot but take notice of the latter passage on p. 5 of the book referring to "cylinder heads" or "breach end" castings. After telling us that these castings are "connected to the cylinder by bolts," it is stated that "the joint should be a ground joint; thin asbestos paper, which is often used as a packing, is liable to be blown out." Anyone who has any practical experience with gas-engines, and particularly with their construction, knows that it is impracticable to have gas-engines with ground breach-end joints. They are machined joints, and the type of jointing material used is not asbestos paper which the author speaks about, but a special kind of jointing which certainly does not blow-out. Similarly, loose expressions are to be noticed on p. 9, where it is stated that "the reciprocating masses of the horizontal engine cause stresses in a horizontal direction tending to slide the engine off its foundation, and necessitating a heavier foundation than in the case of a vertical engine where the stresses are chiefly vertical." One cannot quite realize from this statement why a heavier foundation is required, although one could apprehend that rather stronger foundation bolts would be necessary in the case of a horizontal engine than in the case of a vertical.

In talking of vertical gas-engines, the author states that "where the enclosed type of vertical engine is adopted with splash lubrication, too much oil may get in the cylinder and on the sparking plug, causing ignition to fail, with the consequent trouble of missed explosions and back-firing." He does not mention that all the vertical engines that are made to-day have forced lubrication only, and that splash lubrication is now confined to the motor-car type of petrol engine. Attention might also be called to another defect of this particular book, and exhibited in several of the illustrations—for example, fig. 5, thermo-syphon cooling. It is one of the elementary principles of gas-engine installation to make sure that the bottom of the circulating water tank is certainly not lower than the centre of the engine cylinder. In the illustration under notice, more than one-half of the water in the circulating tank would not be of effective use. Again, in fig. 12, a section is given of a balanced exhaust valve; but this type has been given up by Messrs. Crossley for many years. Regarding fig. 13, it is noted that this illustrates a "cylinder oil pump." The drawing is nothing of the sort. It is one of the earliest types of oil dip-feed lubricators, that was first put on the old slide-valve engine 30 to 40 years ago. It is certainly not a pump. A wire is dipped into the oil well, and deposits at each revolution of the lubricator pulley a drop of oil at the end of the tube, which finally conducts it to the piston and cylinder. In the chapter on ignition, it is noticeable that there is no description of the low-tension magneto,

* "Elementary Internal Combustion Engines." By J. W. Kershaw, M.Sc. (Vict.), M.Eng. (Sheff.) London; Longmans, Green, & Co. Price, 5s. net.

although make-and break sparking plugs and a high-tension magneto are illustrated and described.

Dealing with the book broadly, while it is undoubtedly useful for students of engineering, it falls short by a long way of what one could wish for those who have to supervise the working of the various types of gas-engines to be found to-day in so many thousands of factories throughout the world.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Short Paper Evening.

What are termed "short paper evenings" are always looked forward to by members of the Association as likely to lead to good discussions; and the meeting last Friday evening, at the Westminster Technical Institute, which was of this character, came up to expectations. Mr. D. CLEAVE CROSS (Lea Bridge) presided over a large attendance. Three papers were read, each of which produced a long and interesting discussion. The authors and titles were as follows:

Mr. T. W. ANDREWS (South Metropolitan Gas Company)—"Fuel Economy on Gas-Works Boilers."
Mr. WILLIAM BELL (Reading)—"Coal Testing."
Mr. W. NEWTON BOOTH (Woolwich Arsenal)—"Heat Insulating Materials."

The papers, with necessarily summarized reports of the discussions, will be given in next week's "JOURNAL."

The PRESIDENT, in bringing the proceedings to a conclusion, said they would all agree that it had been a most successful meeting, crowded with information. They were deeply grateful to the three authors.

A hearty vote of thanks to the readers of the papers was accorded, on the proposition of Mr. W. GROGONO, seconded by Mr. L. LACEY. This was acknowledged by Mr. BOOTH.

BROWN COALS AND LIGNITES.

In his third and final Cantor Lecture before the Royal Society of Arts, on Monday, Dec. 11, Prof. W. A. BONE, F.R.S., dealt principally with the questions of low-temperature carbonization of these coals, and their use for steam-raising purposes.

He said he did not advocate the low-temperature carbonization of brown coals and lignites on the commercial side, because, though great progress had been made with bituminous coals, the subject was as yet too much in the embryonic stage concerning brown coals to be regarded as of more than scientific interest. There were essential differences between the low-temperature carbonization of these fuels and of bituminous coals, and he did not know of any large-scale plant at present at work upon them. Nevertheless, the study of their behaviour when they were heated to various temperatures was of great assistance in arriving at their chemical constitution, and as giving an indication of the products likely to be available when they were capable of being dealt with commercially, as would be the case in the near future. The objects to be aimed at in subjecting these coals to preliminary treatment by carbonization were: (1) To upgrade and stabilize their character as fuels; (2) to separate from the volatile decomposition products any condensable oils, and also ammonia, if it be recovered in sufficient quantities to pay for its recovery; and (3) to utilize any surplus gas available. Of these objects, one of the most important in the immediate future would be the first—viz., the upgrading of the fuels themselves. These coals were absolutely devoid of any coking properties, and their high percentage of oxygen gave them features which were different from the behaviour of bituminous coals at low temperatures.

While he was not able to show illustrations of any low-temperature carbonization plant in full-scale working for this purpose, an apparatus had been constructed and was in use at South Kensington for testing fuels; and the results obtained with it very closely approximated to those which were found to be the case in practice as far as ordinary coals were concerned. This apparatus, therefore, was useful in enabling conclusions to be drawn in regard to large-scale work upon these brown coals and lignites. Working with this plant, certain results had been obtained with a dry brown coal containing 30 p.ct. oxygen, when carbonizing at 375°, 500°, 700°, and 850° C. There was no evolution of any combustible gas up to 375°, except a very small quantity of carbon monoxide. At 500° temperature, while there was also the evolution of carbon dioxide and water vapour, methane began to appear in the products; and at this temperature about two-thirds of the available oxygen was obtained in the form of oxides of carbon and steam. Passing up to 700° temperature, the evolution of carbon dioxide fell off, but that of methane had gone on rapidly increasing, while hydrogen also appeared; and at this temperature five-sixths of the oxygen came off as oxides of carbon and steam. Going to a temperature of 850°, there was a very large production of hydrogen. These figures obtained from a recent brown coal were very instructive as to the manner in which these coals carbonized at low temperatures.

On these lines, the following results were given of working a dried Morwell coal at different temperatures, the figures representing proportions by weight:

Temperature	500° C.	700° C.	850° C.
Residue	67·6	53·3	50·9
Liquor	7·7	9·1	6·6
Oil and tar	3·5	8·3	3·3
Gas	19·4	26·6	35·6
Total.	98·2	97·3	100·4

Everything pointed to the fact that the gas formed at the higher temperature was at the expense of the oil.

A great deal of nonsense was talked as to brown coals and lignites being capable of producing very large amounts of valuable oils and tars having unheard-of properties and qualities. This must be taken with a considerable "grain of salt," because, so far as his investigations went, one must not expect from these lignites such high yields of tars and oils as were obtained from bituminous coals. One fact brought out was that, by going to a temperature of 850°, the whole of the oxygen was got rid of, and a very good type of charcoal fuel obtained. He believed it would be from this point of view that the carbonization of these fuels would be taken up. The likely yields of oils were shown from the following figures obtained from a good lignite carbonized at from 470° to 550° C.

Oils.	Density.	Lbs. per Ton of Coal.
Light spirits	0·85	13·8
Light oils	0·88	19·8
Intermediate oils	0·95	6·7
Heavy oils	1·0	22·5
Pitch	1·1	23·7

The residue from these experiments was in appearance difficult to distinguish from the original coal. The oils, for the most part, were of the naphthalene or hydrobenzene series, with very little paraffin hydrocarbons. When the higher fractions were cooled, a certain amount of waxy material was obtained, which was hydrocarbon in character.

Passing to the question of what to do with the solid residue from the carbonization process, Prof. Bone said that if it were mixed with about 5 p.ct. of pitch it made a valuable smokeless fuel, there being some 15 p.ct. of volatile matter remaining, if the temperature of carbonization was kept within the limits mentioned (up to 550° C.); and if briquetted into about the size of walnuts, it formed an excellent fuel for use with chain-grate water-tube boilers. The difficulty was that there was not sufficient pitch obtained from the process to provide the amount required for briquetting; and one of the difficulties confronting the technologist, in dealing with these brown coals and preparing them to rank as a good steam-raising fuel to stand transport, was to find a suitable substitute or substitutes for the pitch.

This residue formed a good fuel for gas-producer purposes, but even then it was advisable to briquette it before use. His experience was that there was no difficulty in gasifying either raw lignite or the carbonized residue in gas-producers, especially of the ammonia recovery type. The results of trials some years ago with French and Italian brown coal in a Mond gas plant showed 5·4 p.ct. and 4·8 p.ct. of methane. A later trial by himself with a Malayan lignite containing 20 p.ct. of water, but with no ammonia recovery, gave 5 p.ct. methane. The actual yield of gas, of course, was much smaller than when using bituminous coal; but from 70,000 to 80,000 c.ft. of gas having a calorific value of 175 B.Th.U. gross was, in his opinion, a very good result, having regard to the nature of the fuel.

Prof. H. E. ARMSTRONG, F.R.S. (who was in the chair), proposing a vote of thanks to Prof. Bone, said they had got to make use of these new fuels existing in Australia and elsewhere. He believed they were to be found in considerable quantities in Ireland; and it was obvious that the scientific treatment of them was overdue. Indeed, it was astonishing that it had only been taken up in recent times; but there was now a vast amount of enthusiasm with regard to them. There was, for instance, that hitherto neglected species of chemist, the gas-works chemist, who had been dominated by that person to whom the lecturer had drawn attention—viz., the engineer. The gas-works chemist was beginning to emancipate himself. He had been speaking to one only that day, and he was jumping for joy at the problems coming to hand in connection with this question of carbonization of coal under conditions which the gas industry had hitherto generally lacked.

Prof. BONE, expressing his appreciation of the vote of thanks, said he hoped that the powers that be would not only permit, but would see to it, that a proper scientific investigation of these problems was put in hand, and under the right auspices. If this were done, he believed there would be a very rapid development during the next five or ten years.

Mr. Frederick Edward Linging, at one time Engineer and Manager of the Norwich Station of the British Gas Light Company, whose death occurred recently at the age of 75, left estate of the gross value of £38,305.

CONTROLLED FLAMELESS FIRING, WITHOUT AN EXPLOSIVE MIXTURE.

"CAPTIVE FIRE."

Seven years ago, a system of firing was developed to ensure a constant mixture of air and gaseous fuel, whatever the variations of inlet pressure on the one hand, and consumption on the other. The figures from which the curve reproduced below was constructed were published by Sir Dugald Clerk in 1886.

The results of applying the principles indicated above were phenomenal.

TABLE I.—*Trials of Firing Systems at Sheffield*, 1922.

Inside dimensions of furnace and loading conditions the same in both cases; and trials carried out under working conditions, and joint supervision, to meet the special and varying requirements of the manufacturer.

—	"Captive Fire."			Competitive Furnace.		
	Lbs.	C.Ft. Gas.	P.Ct. Economy	P.Ct. Economy	Lbs.	C.Ft. Gas.
Aug. 1 . .	6,627	15,956	9·1	—	8,060	21,394
,, 2 . .	8,201	14,271	19·0	—	8,770	18,949
,, 3 . .	7,024	12,626	24·3	—	6,986	16,516
,, 4 . .	2,481	4,787	23·2	—	2,487	6,247
Shut down.						
Aug. 14 . .	5,155	19,242	—	1·59	5,154	19,120
,, 15 . .	5,552	12,418	8·2	—	6,203	15,156
,, 16 . .	6,210	12,837	17·6	—	6,310	15,827
,, 17 . .	5,288	12,493	26·5	—	5,368	17 222
,, 18 . .	6,412	15,428	23·8	—	6,076	19,142
Shut down.						
Aug. 21 . .	4,108	17,438	—	4·7	4,876	19,720
,, 22 . .	7,710	13,809	14·7	—	7,956	16,748
,, 23 . .	7,465	14,038	17·24	—	8,303	18,864
,, 24 . .	7,926	13,154	23·5	—	7,856	17,036
,, 25 . .	8,545	16,023	11·4	—	10,345	21,893
Shut down.						
Aug. 28 . .	7,613	18,693	—	7·75	9,500	21,478
,, 29 . .	6,940	13,189	24·0	—	6,838	17,102
,, 30 . .	9,571	15,589	18 6	—	9,534	18,988
,, 31 . .	5,231	10,522	22·7	—	6,438	16,715
Sept. 1 . .	10,304	17,480	25·2	—	9,648	21,851
Shut down.						
Sept. 4 . .	7,468	19,002	2·3	—	8,414	21,941
,, 5 . .	9,952	15,482	16·6	—	10,666	19,810
,, 6 . .	8,136	13,437	25·6	—	8,846	19,661
,, 7 . .	9,437	14,894	21·5	—	10,146	20,103
,, 8 . .	12,208	18,344	20·5	—	13,768	25,922
	175,564	351,152			188,548	447,405

"Captive Fire" economy on low temperature annealing, Aug. 1–Sept. 9, 16 p.ct.—subject to corrections in its favour.

To the thoughtful reader it must be quite clear that if the mixture is not controlled, there must be a great, if not a criminal, wastage; and it is to be observed that the higher the temperature the greater the economy, for there cannot be an economy where there is no heating at all, and if the mixture is not right you can use fuel *ad infinitum* without being able to attain the higher temperatures.

In 1916 the superintendent of one of the largest factories in England testified, over the firm's signature, that the average consumption per hour on a whole day's work by "Captive Fire" was 240 to 250 c.ft. per hour, against a consumption of 500 c.ft. per hour by a Brown and Sharpe furnace of similar dimensions.

Subsequently, in 1918, this same gentleman confirmed that the economy shown by "Captive Fire" was rather over than under 50 p.ct. An air heater was also installed at this factory, and showed 88·5 p.ct. efficiency. Nevertheless, after seven years, this system is not generally known.

The inventor's terms may have been at fault. He asked merely to be paid by results—in the shape of a proportion of the economy his system afforded. This involved measuring consumption, and it would seem that the majority of British firms have an incorrigible aversion to doing this. As examples, however, of the way in which these terms work, the following figures are of interest.

TABLE II.—*Comparison between the "Captive Fire" Gas Annealing Furnace and Coke Annealing Furnaces.*

The figures are those of the London Small Arms Company, Ltd.; and as a result of this test run, extending over 2600 hours, they applied for a licence to use "Captive Fire."

COPY.

Oct. 21, 1918.

"CAPTIVE FIRE" GAS ANNEALING FURNACE.

	£ s. d.
Hours at work, 2600.	
Total weight of components annealed, 121,780 lbs.	
Gas consumed in 2600 hours, 778,190 c.ft., at 2s. 4d. .	*91 5 6
Meter rent	1 3 0
Electricity used by motor (estimated)	†24 7 6
This amount would be increased by a very small percentage if gas furnaces were erected to anneal the whole output of components.	
50 p.ct. royalty to pay on above consumption . . .	45 17 9
	£162 13 9

The estimated cost of maintaining one gas-furnace is between £40 and £50 per annum.
The above represents, approximately, three months' work.

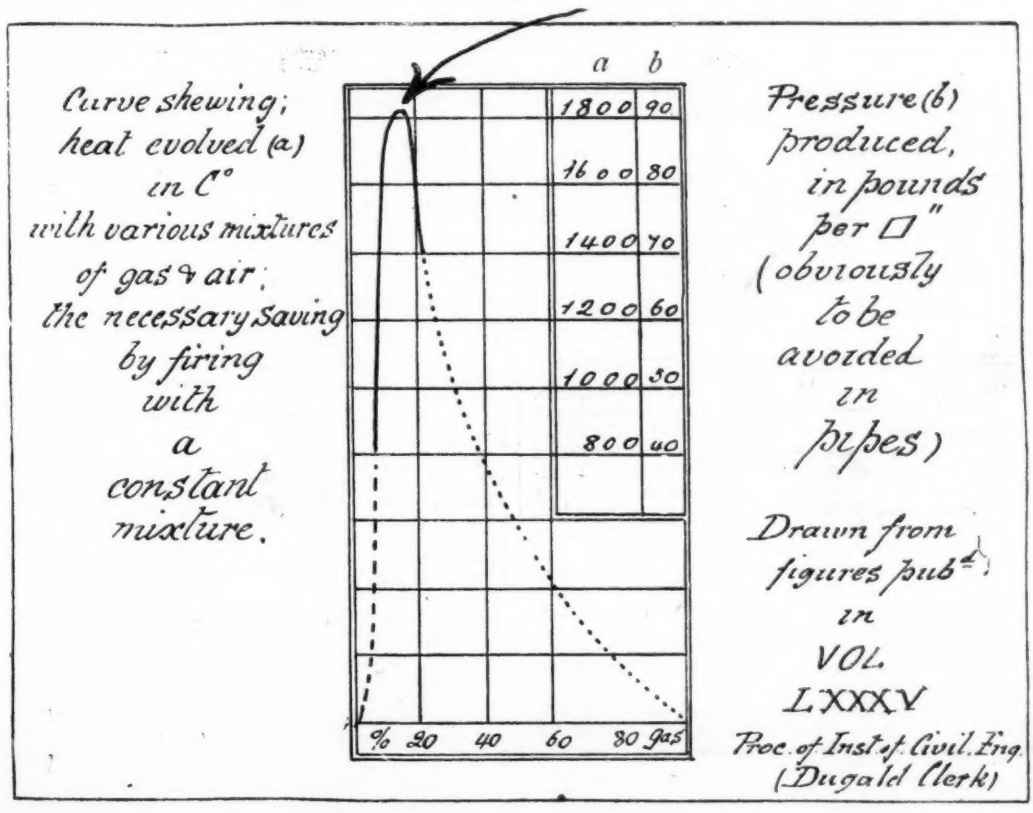
COKE ANNEALING FURNACES.

	£ s. d.
Hours at work, 6621.	
Total weight of components annealed, 121,780 lbs.	
Coke used, 95 chaldrons, at 24s. 6d.	116 7 6
Cost of labour, and other accessories in firing . . .	81 6 0
	£197 13 6

The estimated cost of maintaining one coke-furnace is about £50 per annum.

Cost of coke-furnace	197 13 6
Cost of gas-furnace	162 13 9
Approximate saving by working one gas-furnace for three months	£34 19 9

(Signed) A. W. D.


Curve shewing; heat evolved (a) in C° with various mixtures of gas & air; the necessary saving by firing with a constant mixture.
a b
1800 90
1600 80
1400 70
1200 60
1000 50
800 40
% 20 40 60 80 gas
Pressure (b) produced, in pounds per □" (obviously to be avoided in pipes)
Drawn from figures pub^d in VOL. LXXXV Proc. of Inst. of Civil Eng. (Dugald Clerk)

REPORT.

Oct. 21, 1918.

It will be noticed that it takes 2600 hours to anneal 121,780 lbs. of components in the gas-furnace; but to anneal the same weight in a coke-furnace it takes 6621 hours, which equals about two-and-a-half times longer, and consequently this gives the gas-furnace the advantage in the cost of working.

It would take about three-and-a-half hours, with one man in attendance, to heat-up sufficient gas-furnaces to anneal the whole output of components, and which would consume about 12,000 c.ft. of gas (at 2s. 4d. per 1000 c.ft., would equal 28s.).

To heat-up the coke-furnace, it requires two tons of coke and two men in attendance for fourteen hours (six hours at double time, and eight hours at time-and-a-quarter).

The estimated annual cost of maintenance, in both cases, is about £50 each furnace; but, as only half the number of "Captive Fire" furnaces would be required to anneal the whole output, the total annual cost of maintenance would also be halved.

(Signed) A. W. D.

NOTE.—* This is an error, it should be £90 15s.

NOTE.—† This amount of electricity would serve for thirteen furnaces, but is actually, in this case, only serving one furnace. Therefore the cost, £24 7s. 6d., should be divided at least by 12, if, as the Manager says, the whole output could be annealed by "Captive Fire." This would make the amount come out at £2. The comparison would then be as follows:

"CAPTIVE FIRE" FURNACE.				COKE-FURNACE.			
Hours at work, 2600.				Hours at work, 6621.			
Total weight of components annealed, 121,780 lbs.				Total weight of components annealed, 121,780 lbs.			
Gas consumed in 2600 hours, 778,190 c.ft., at 2s. 4d.	£90	15	0	Coke used, 95 chalds., at 24s. 6d.	£116	7	6
Meter rent	1	3	0	Cost of labour and other accessories in firing .	81	6	0
Electricity used by motor	2	0	0	Upkeep expenses for 6621 hours	31	5	0
Upkeep expenses for 2600 hours	12	10	0				
	£106	8	0		£228	18	6

Bringing the economy with one 54 in. by 18 in. by 13 in. "Captive Fire" furnace to £490 per annum. The whole installation cost £212.

The following figures relate to a foundry which melts aluminium, gunmetal, phosphor bronze, and spelter. Of course, the economy will fluctuate with the variations in the proportions of these metals melted. The economies effected during seven quarters are as follows:

TABLE III.

Over-all Consumption on Output Prior to Installing "Captive Fire."	Date.	Over-all "Captive Fire" Consumption on Output.	Economy, P.Ct.
	1921.		
28·3 c.ft. per lb.	March	20 c.ft. per lb.	29·4
	June	17 1 ,, ,,	39·2
	Sept.	28·7 ,, ,,	—
	Dec.	18·5 ,, ,,	34·5
	1922.		
	March	16·6 ,, ,,	41·4
	June	20·2 ,, ,,	28·7
	Sept.	21·1 ,, ,,	25 5

These economies were divided in the proportion of 25 p.ct. to the inventor and 75 p.ct. to the client.

The inventor has now decided to offer some pressure-balances and valves at fixed prices, so that purchasers may themselves apply the system of firing. Should they, however, wish to avail themselves of the inventor's experience, this, we understand, is at their disposal, on terms to be agreed upon, in accordance with the nature of the application, as in the above examples.

Details of all tests, installations, &c., referred to in this article can be seen at the "Captive Fire" Laboratory, No. 6, Fulton Mews, Porchester Terrace, W.2, to which address inquiries may be forwarded.

Coal Tars as Engine Fuel.—It was stated by Mr. Harold Moore, M.Sc., in a paper read before the North-East Coast Institution of Engineers and Shipbuilders, at Newcastle, that on the Continent raw coal tars had been utilized on a large scale as fuel for Diesel engines. In this country their use had been almost entirely confined to experimental work. The crude coal tars presented the ignition difficulties usually encountered with coal-tar products, but, in addition, they contained bituminous bodies and a solid substance present in an extremely fine state, known as "free carbon." This substance was not actually carbon, but, on analysis, was found to contain about 2½ p.ct. of hydrogen and 4½ p.ct. of oxygen and nitrogen. Experience showed that free carbon burned much more slowly than the other portion of the oil; and, unless the engine conditions were entirely favourable, sparks would accompany the exhaust gases. The sparks were almost certainly burning particles of free carbon. As might be expected, high free-carbon content was frequently the cause of the pitting of exhaust valves in four-stroke engines. Two-stroke engines, exhausting through ports, did not suffer from this complaint.

INCANDESCENT LIGHTING*.

THIS addition to Messrs. Pitman's "Common Commodities and Industries" fully maintains the standards of the series to which it belongs. The book should commend itself to gas salesmen, engineers, and consumers who take an intelligent interest in the history and manufacture of some of the products which they either sell or use.

Although dealing in the main with the gas-mantle, the comprehensive definition of incandescent lighting adopted by the author has allowed him to deal with lighting by candles, oil, gas, and electricity, especially in the interesting historical sketch which forms the opening chapter of the book. The historical treatment as applied to the gas-mantle is continued in the second chapter, and the work of Auer von Welsbach is referred to at length. In dealing with the valuable help given to the gas-lighting load by the Welsbach mantle, the author has rather under-estimated the natural growth of the gas industry in its other branches. The fabric for the manufacture of the mantle receives attention in this chapter; the disadvantages of cotton and the valuable properties of ramie and artificial silk being dealt with. A very brief sketch of types of gas-fittings is given; but attention is confined almost exclusively to inverted burners. There are some excellent illustrations showing street lighting by means of high-pressure lamps.

Chapter III. deals with the rare-earth industry, which would seem remarkable for the very elaborate technical control which is essential for attaining a satisfactory product, but which control is nevertheless compatible with the working of the earths as a commercially sound industry. The concentration of monazite sand by hydraulic and magnetic means is described at length, as well as the subsequent preparation of pure thorium and cerium compounds by chemical processes. There is apparently some difficulty in finding a use for the cerium compounds which are separated at the same time, considerably in excess of the requirements of the mantle industry.

Chapter IV. is devoted to the manufacture of incandescent mantles and some of the difficulties encountered in obtaining products which are sufficiently durable and satisfactory as regards their light emission when in use. Modern methods of lighting are compared in Chapter V., and a table is given showing the cost of lighting per 1000 candle-hours by oil, gas, and electricity respectively; each agent being utilized in a variety of ways. The calculations are made solely upon certain assumed costs per unit for oil, gas, and electricity. A more complete estimate would, of course, include allowances for initial and maintenance costs of the systems, as well as the cost of the energy consumed. This is, as a matter of fact, mentioned at a later stage by the author, who does not, however, indicate to what extent the order of the total operating costs would be altered, in the case of domestic lighting for example, by taking into account renewals of gas-mantles at (say) 8d. each, and of metal-filament lamps of equal candle power at six or seven times this price.

This chapter contains a brief and very misleading sketch of modern gas-works practice; and in view of the prominence into which the matter has been recently brought, one might have expected greater accuracy of statement with regard to the origin, scope, and provisions of the Gas Regulation Act, 1920, than appears in the book. For example, contrary to the statement made, the Act does not impose any limit upon the quantity of inerts, for the inquiry into this matter by the Board of Trade resulted in the recommendation that no restriction is at present necessary or advisable. The therm, also, is incorrectly defined, being in fact 100,000 B.Th.U., and having nothing whatever to do with the determination of the calorific value of the gas by an examiner! The excellent work of the South Metropolitan Company in the sphere of gas lighting receives prominent treatment; but the author does not make it clear that the methods adopted by that Company are practically unique, and that their application throughout the country would entail the same elaborate organization and control on a much larger scale, and certainly some modification of the "standardized" burners to meet the peculiar conditions of local gas supplies. No mention has been made of attempts upon the part of burner or mantle manufacturers to provide new sizes and shapes of appliances or mantles for the more efficient utilization of the wide range of gas qualities manufactured by modern carbonizing methods and permitted to be sold by recent legislation.

The concluding chapter deals with the old question of the very low energy efficiency of even the best of our light-producing sources. Some of the efficiencies given are open to dispute. In view of the prominence which has been given recently to the mantle industry under the "Safeguarding of Industries Act," the book would have acquired added interest if a few statistics as to quantities of materials, or their monetary value, had been included, so enabling one to place the industry in its correct position with respect to the parent gas industry. The book concludes with well-chosen name and subject indexes.

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* "Incandescent Lighting." S. I. Levy, B.A., B.Sc., F.I.C.; 124 pp., 8vo., 22 illustrations. London: Sir Isaac Pitman and Sons, Ltd. Price, 3s. net.

MODERN GAS-WORKS CHEMISTRY.*

THERE has been a pressing need for a book dealing with the chemical control of gas manufacture. The American Gas Association recently issued a compilation of practical laboratory methods, which, though, useful for reference, is out of touch with British conditions. Dr. Weyman can then be sure of a welcome for a book which "has not been written with the intention of discussing the chemical and physical theories which form the basis of the various processes carried out and the relative merits of various types of plant. Rather it is intended to describe the methods of controlling plants and processes in everyday use, in the hope that those who are endeavouring to introduce scientific control may be saved much time and trouble."

The first impression one gets of the book is that its price is high, although it is admittedly "well got-up" and a credit to the author and publisher alike. Certainly the price need be no obstacle to any undertaking seeking to share the experience of a well-qualified chemist holding a responsible position in an important gas company. To the young student and many a worker in the industry, however, the case is different, and 25s. for a book of this type and size is a serious matter. One can only hope that the publishing world generally has this aspect in view. Technical books, judged by pre-war standards, are still very dear—much too dear for many who need and wish to buy them.

The personal note is often in evidence. The author adds his opinions, comments, and advice here and there; and this feature is at once noticeable in the first chapter—on the organization and equipment for the chemical control of a gas-works. Here, though mentioning the physical testing that may be necessary, the author says little of the equipment for what seems to be regarded as outside the scope of the book.

The next chapter deals with coal and its testing. Analytical methods and small-scale distillation tests are traversed. The author writes for a public supposed to be already informed chemically, and with knowledge of the carbonization processes. He does not dwell on the minutiæ of analytical methods and other topics, but collects at the end of each chapter a bibliography of relevant literature for reference—a welcome feature which might with advantage be extended. Even the references given have a wider scope than set out in the preface. Thus he is able to cover much ground in the 170 pages of the text. The author does not seek to include every available method. In this chapter, for instance, he does not refer to peroxide fusion as a means of determining sulphur. The recent studies of the sulphur in coal and coke by Powell, Parr, and Wibaut deserve mention in a future edition.

Chapter III. deals with carbonization and the chemical control of the retort-house—the choice and blending of coals for carbonization, and the relation between conditions conducing to good and bad working, both in horizontal and vertical retorts. The chapters on the manufacturing operations and their chemical control are readable, and should prove the most useful to the practising gas engineer. They reveal the author's intimacy with details of practice and the pitfalls against which the chemist can exercise to best advantage his preventive efforts.

Coke and its testing are dealt with in Chapter IV. The first paragraph on the essential qualities of a coke contains recommendations too often neglected. In the section on tests on ash for fusion range, there is some obscurity (p. 52): "Cokes with low softening ashes are not always to be preferred if the fusion range is large." There seems here to be an implied, though not very obvious, advantage in easy fusibility. There follows a description of a furnace to be improvised in the gas-works from loose bricks, possibly at a low cost, though its economy in use seems more problematical. The same type of furnace is suggested in Chapter VI. for testing the refractoriness of firebricks, but this time with the use of oxygen in place of air. The use of oxygen for achieving the last stages of fusion is an attractive proposal; and one could wish for more detail as to construction and operation and to consumption of oxygen than Dr. Weyman has given. It is the fusion of cones above No. 30 which is responsible for most of the time and trouble in brick testing; and probably the results of enriching the air supplied to the furnace will outweigh the cost.

Attention may well be drawn here to the author's recommendations to measure "fusion range" for coal ashes and refractories. The wisdom of this is open to discussion, especially when the refractories are in question. The first signs of fusion in a high-temperature gas-furnace are difficult (in enclosed types impossible) to observe. One can say with more certainty that the sample is equivalent in fusibility to a certain standard cone, and therein is the integration of all the chemical and physical processes which, in the time available, conspire to bring down the test-piece and cones. One may also question the recommendation (p. 65) to make cones "by breaking the brick down and remoulding it." The texture of a brick is something upon which depends its resistance to influences at high temperatures. It is desirable to be cautious about interfering with that texture before testing, although the large grains in siliceous products do present a real difficulty here.

In this chapter (VI.) considerable space is devoted to the chemical and physical tests of refractories. An unusua amount of attention is given to the tests of insulating materials, and indeed the only photographic plate in the book is devoted to illustrations of an apparatus for making such tests, which very few gas-works will be able to instal. In the references given, the important publication by E. Griffiths, of the National Physical Laboratory, on this subject has been overlooked.

Chapter V. is devoted to the maintenance of heats and the necessary control—pyrometric and gas analytical. The author refers briefly to various methods of high-temperature measurement, although the disappearing-filament type of optical pyrometer is not mentioned. The "Wanner" type of pyrometer is calibrated against a flame of "amyl acetate"—not "pentane," as stated on p. 56. Detail is left, and wisely, to special works; but an indication of the author's preference would be useful to those contemplating the considerable outlay for such apparatus. The subject matter of the book is comprehensive enough without overloading with subjects which can be adequately dealt with only in such specialist books as are available.

Chapter VII., devoted to tar, commences with a penetrating account of its recovery from the crude gas. The temperature control of the cooling and condensation system receives special attention, and the lay-out of an extensive recording resistance thermometer installation is described. The knotty problem of sampling tar is examined, and methods of analysis of tar and its fractions receive detailed treatment.

Chapter VIII., on ammonia, gives a succinct account of the recovery process, with hints as to the avenues whereby ammonia losses occur. The chemical control of ammonia right through the works, to sulphate of ammonia, is covered.

Chapter IX., on oxide purification, as might be expected, contains an interesting account of the elusive chemistry of this process, both in good and bad order. The analytical control of the process and its products is given; but neither here nor elsewhere in the book is there any special treatment of the removal of cyanogen compounds. This is a notable omission, considering the attention directed to-day to this objectionable, if inconspicuous, constituent.

Chapter X. is a very important one, dealing with the testing and analysis of the finished gas—both the major and minor constituents. Typical gas-analysis apparatus, both of constant pressure and constant volume types, is described. Gas calorimetry might have been given more space, considering its present legal and technical importance. The reviewer would feel inclined to be more insistent than the author on the advisability of care in the calibration of thermometers (p. 123). No pitfalls of gas calorimetry are more easily overlooked and also remedied than those due to inaccurate thermometers; and the operator should be placed on his guard against them. In this chapter there is a notable absence of any reference to photometry or to the testing of appliances used for the consumption of gas. As regards photometry, it is true that the legal illuminating standards have only historical importance; but the efficiency of burners remains a subject of very lively interest. The reader finds reference to the determination of benzene, &c., but with insufficient detail to enable him to make any exhaustive benzole analysis without seeking information elsewhere. Naphthalene, looming so largely in the gas manager's horizon, is briefly traversed with a reference to Thomas's data of vapour tension.

Chapter XI. treats of the manufacture of blue and carburetted water gas, and the chemical control of the process. The testing of gas oil, which concerns so many to-day, could justify more space than is allotted to it.

Chapter XII. deals with water analysis and steam raising, and Chaper XIII. with lubricants—fields where the chemist's intervention can be of great value, though, if it is considered desirable to go outside the gas manufacture process at all, it is not clear why these have been selected in preference to the great variety of other stores. A number of tables of useful data complete the book.

It is certain that Dr. Weyman has done a good work in writing this book, for which a pressing need has long existed. There are many evidences that the author is quoting his own experience; and this personal touch is something to be prized above the mere compilation of "unscreened" material. The reviewer will make no criticism in a carping spirit, well knowing the labour its production has involved, the help which the book will render to many, and the difficulty in selecting material for inclusion. The omissions referred to above bring home the ramifications of gas technology—ramifications on such a scale that any book which is to provide a complete *vade mecum* to the practising gas chemist must of necessity be a large one.

Perhaps Dr. Weyman looks forward to filling up vacancies in the second edition. Though setting out in the preface to be a manual of analytical methods and not a treatise on gas-works chemical theory, actually the book blends both. It is more likely to be appreciated by the man of experience than the young student making early steps; and the reviewer thinks that it should find its way to the shelves of all who are interested in the technology of gas-making.

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* Modern Gas-Works Chemistry, by Geoffrey Weyman, D.Sc., F.I.C. London: Benn Brothers; price, 25s. net.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will take place on Tuesday, Jan. 23, at 2.30 p.m., at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the Yorkshire Junior Gas Association was held on Saturday afternoon, Dec. 16, in the meeting room of the Halifax Corporation Gas Committee, at the Gas Department Offices, Mulcture Hall Road, Halifax. Mr. H. L. BATEMAN, of Wakefield, presided over a large attendance; and the members were heartily welcomed by Mr. W. B. M'Lusky, the Halifax Gas Engineer and General Manager. Apologies for absence were received from Mr. F. H. Robinson, Engineer and Manager to the Harrogate Gas Company, and representative of the Manchester District Institution on the Yorkshire Junior Association's Council, who wrote that, as one particularly interested in complete gasification, he missed the meeting with the greatest regret; and from Mr. J. Wilkinson, of Nottingham.

Mr. N. SAMPSON SMITH, B.Sc. (Gas Eng.), of Ossett, read the following paper on

COMPLETE GASIFICATION AND THE TULLY PLANT.

It was with the greatest hesitation that I consented to read this essay to you; and it was only the assurance that I was filling a gap which led to my agreeing to do so, as I am very much a junior. But although I apologize for the meagre contents, with the greater part of which you will be thoroughly conversant, I think the subject of complete gasification is one of fundamental importance, which may hold much in store.

By the complete gasification of coal we mean that treatment of coal which transforms its heat energy into gas under such conditions that only ash remains. This can be effected in two distinct ways. One way is to gasify the coal in two stages; first carbonizing it in the ordinary manner, and then gasifying the resulting coke in a water-gas generator, ultimately mixing the coal gas and the water gas, which latter can either be straight or carburetted. The second way is to complete the whole process in one plant. In the first method we are faced with the loss of heat resulting from carbonization, and a further loss of heat in the gasification process. The work of several investigators in the past has shown that theoretically little or no heat is required to split-up coal into its various products, and that loss of heat in carbonization is due to practical difficulties, caused by the low conductivity of the retort material and of the coal itself, and the loss of sensible heat in the products. If, then, these heat losses can be obviated, a greater thermal efficiency of gas production will necessarily result. The best way of getting rid of the heat losses in the carbonization stage is to carry out both operations at the same time. The producer, of course, is a complete gasification plant, where air and steam are injected into the fuel, when the following reactions take place:

(*a*) $C + \frac{1}{2}(O_2 + 4N_2) = CO + 2N_2 + 29{,}000$ calories.
(*b*) $C + H_2O = H_2 + CO - 29{,}000$ calories.

The heat evolution of (*a*) is equal to the heat absorption of (*b*); and by regulating the supply of steam and air, the process of gasification takes place continuously without the application of external heat. The gas, however, contains a very large proportion of nitrogen; and this constitutes the loss in thermal efficiency, by extracting a large amount of heat to raise its temperature. This large inert content renders it inapplicable for distribution for domestic purposes. The nitrogen is eliminated in the water-gas process, where the gas making is intermittent; the necessary temperature being maintained by reaction (*a*) blowing the products to waste, and then following by reaction (*b*) until the temperature drop makes it necessary to repeat the operation. The main heat losses here are due to the waste of heat in the blow period; and, in so far as this heat is utilized, the thermal efficiency correspondingly increases.

If a retort be superimposed on a generator, and the sensible heat of the water gas can be used to carbonize coal in the retort, an increased thermal efficiency should be obtained. This, together with the utilization of the heat generated by the burning of carbon monoxide to carbon dioxide in the chequer brickwork surrounding the retort, is the fundamental idea underlying the Tully plant, and is common to several other methods which have been adopted for complete gasification; the construction of the Tully plant differing but little from some other types.

The Clerk-Smithells-Cobb Report of 1919 contends that greater thermal efficiency and financial economy would result if a larger percentage of the heat of the coal could be delivered as gas into the holders. From this report I would like to quote the conclusions drawn from the following table:

Division of Receipts of the South Metropolitan Company in 1913.

			Percentage of Total Receipts.
Net gas rental		£1,403,413	60·3
Meter rental	£83,342		
Stove rental	72,265		
Fittings rental	98,689		
Rents	2,970		
		257,266	11·0
Coke		405,034	17·4
Breeze		7,491	0·3
Tar		111,188	
Ammonium sulphate		143,840	£255,028 — 11·0
		£2,328,232	100·0

If it can be assumed that the gas heat value in the holder be doubled and the price per heat unit remains constant, then the net gas rental becomes £2·806 millions instead of £1·403 millions; but the coke item will be reduced, and, assuming 76 p.ct. water gas conversion, will be £97,200 instead of £405,000—a reduction of £307,800. The total revenue, however, is increased by £1·095 millions.

It cannot be doubted that great relative reductions can still be made in the rates at which heat units are sold to the public; and perhaps the most important item among numerous others will be found in delivering the maximum possible proportion of the total heat of the coal carbonized into the station gasholders.

Division of Receipts of the Three Metropolitan Companies.

	Percentage of Total Receipts.
Net gas rental	64·2
Meter, stove, and fitting rentals and rents	10·0
Coke	15·7
Breeze	0·9
Tar and ammonium sulphate	9·2
	100·0

The increase in thermal efficiency would be translated into all the various loads. Taking, for example, an efficiency of gas production of 75 p.ct.—out of every 100 heat units which are used at the gas-works to produce the gas, 43·5 would appear in a room as the effect of heating by a gas-fire. With ever-increasing electrical competition and activity, any such increase is most desirable. From a national standpoint also, any increase in the thermal efficiency of gas production would tend to conserve our limited and ever-decreasing coal supplies.

Perhaps the solution of the problem of total gasification lies in the future prospect that supplies of oxygen may be obtained cheaply. This is discussed in a paper by Hodsman and Cobb, who give an efficiency of gas production of 90·1 p.ct. where fuel for steam raising is deducted, in which case 69,100 c.ft. of gas would be obtained of a gross calorific value of 352 B.Th.U. per c.ft. If such an efficiency were attained, the heat value of the coal could be distributed with but little loss to the consumer, who, by using the most economical appliance for the purpose in hand, would be able to derive much more benefit than by the use of raw fuel. Consider a modern gas-engine working at a brake thermal efficiency of 25 p.ct. Then out of every 100 heat units used at the gas-works, 22·5 would appear as work. Contrast this with the present efficiency of electricity generation, which for a remarkably good undertaking is 11·7 p.ct. If we take the efficiency of an electric motor as 90 p.ct., only 10·5 heat units appear as work out of every 100 heat units used at the generating station.

Many papers have been written about complete gasification with the Tully plant, but it is hard to find any figures relating to the thermal efficiency and cost of production using the Tully plant alone. Most of the papers where figures have been given have been concerned with Tully gas mixed with coal gas; and I venture to think that a few figures solely concerning the plant will be of interest, as so many diverse statements have been made.

I do not wish to spend much time with the construction and practical working of the Tully plant, which has been so excellently dealt with already. It is of interest, however, to trace briefly the evolution of the plant as it exists to-day; and I should like to give a short outline of its history.

Twenty years ago, Mr. C. B. Tully (who at that time was Manager of the Sligo Gas-Works) wrote a paper on his methane-hydrogen plant. This plant was a modification of an ordinary water-gas generator, altered in such a way as to allow of the carburetting by tar during the periods of gas making. In this plant steam was injected through the same openings as air blast. The generator was charged with either coke or anthracite; the fuel being raised to a state of incandescence by means of air blasts arranged circumferentially, carrying steam-pipes in their interior. A series of outlets was placed at the middle of the generator, which communicated with a flue having its exit into a stack-pipe. Another exit was provided at the top of the generator, also leading into the same pipe. Both these outlets were fitted with valves, in order that the products of combustion during the blow period could find an exit into the stack-pipe either from the middle or from the top. Having attained the necessary temperature during the blow period, the snift valve fitted on the top of the stack-pipe was closed and tar injected by steam between the nostrils and the bottom of the generator; a clear space for this injection being ensured by means of an inward projection. A further steam supply was injected through the pipes fitted into the blast inlets, and the resulting gases passed to the atmospheric coolers. It was claimed that by this means all the tar injected was completely split-up, that a gas was obtained of an average calorific value of 380 B.Th.U. per c.ft., and that the gas made was obtained at a cost one-third of that of coal gas and at the same cost as that of straight water gas. There is no mention in the paper of the amount of tar injected, and no working figures are given.

The next we hear about the plant is another communication by Mr. Tully in 1905, where it is now used in conjunction with a carburettor and superheater; the object of the plant being to use less coke and oil, and more tar to compensate for these lower amounts, in order to obtain carburetted water gas. The gas obtained during the blow was mixed with air and burned in the annular space which surrounds the upper half of the generator, the annular lining serving to heat the coke. At the same time,

tar was injected into the upper portion of the fuel, and was decomposed. The solid products of the tar were deposited, and the volatile portion descended to the nostrils and, together with the blast gases, passed into the carburettor and superheater, where the combined gases were burned to produce the necessary working temperature. In this way the tar was utilized in order to effect a saving of coke. During the gas-making period steam and tar were injected into the lower fuel. Tar was also injected in the upper half. It was stated in this paper that the cost of manufacture of the gas was considerably reduced as compared with the ordinary mode of procedure, the methane-hydrogen gas produced in the generator having a calorific value of 400 B.Th.U. per c.ft.

The next publication concerns the plant which has now been adopted for the complete gasification of coal; and I should like to draw attention to a paper by Mr. Tully in the "JOURNAL" in 1919 [Vol. CXLVIII., p. 651], from which I quote the following paragraph:

> Professor Lewes and the author used Dellwik's idea of blowing to complete combustion through a shallow bed of fuel, but went one better by utilizing the hot blast gases to heat-up a retort and regenerator instead of blowing it to waste as he did. If Dellwik obtained 66 p.ct. efficiency, the improved plant certainly raised it to at least 75 p.ct.

It was also stated that the Tully plant would turn out gas of 500 B.Th.U. The make would be 60,000 c.ft. per ton, giving 24,000,000 B.Th.U. per ton of coal. It was stated that 60,000 c.ft. of 380 B.Th.U. gas had been obtained from a mixture of coke and 25 p.ct. of low-grade Nottingham cannel, the gas containing 18·5 p.ct. of methane, and that gas of 425 B.Th.U. could be produced as cheap as, if not cheaper than, blue water gas. So much for ancient history.

With regard to the plant which was installed at Ossett in January, 1921, this has a specified capacity of 300,000 c.ft. per twenty-four hours, and consists of a steel cylinder divided into two parts, the top half containing a vertical retort surrounded by chequer brickwork, the bottom half consisting of the generator. Both the generator and the retort are built up of bricks on end, and the space between the brickwork and the steel is packed with non-conducting material. The plant is fitted with a flat grate. It had been found that by using a step-grate the blast was apt to travel circumferentially round the charge; the reason being that the larger pieces of fuel have a tendency to fall outwards, the small fuel remaining as a compact central core offering greater resistance to the blast. The newer grates, then, are so designed as to concentrate as far as possible the bulk of the heat in the centre of the generator, thereby minimizing the tendency of fused clinker to adhere to the walls. This is important not only from the standpoint of cost of lining repairs, but also from the falling-off of make. The chequer brickwork communicates with the waste-gas outlet, at the top of which is fitted a snift valve. Below the level of the grate is the off-take pipe for down-run gas. On one side are the main and secondary air valves, so arranged that the opening of the snift and the air valves is done simultaneously by means of a wheel. On the other side of the generator a wash-box is fitted with the up-run and down-run valves and steam valves; and these are so connected that they work together. In the plant at Ossett, I think the wash-box is of insufficient size; much trouble being caused by the accumulation of dirt, necessitating time lost in cleaning out. The fuel is elevated to the charging platform by means of an ordinary bucket conveyor, worked by a 3 H.P. steam-engine. Recent improvements to the Tully plant include a central fuel feed from suitable hoppers. It is possible to fit a mechanical grate for the discharge of ash, and also a waste-heat boiler for utilizing the heat in the blow gases. The working consists of three minutes' blow and five minutes' make, the latter alternately up and down.

In carrying out the tests upon the plant, all possible precautions were taken to obtain a fair degree of accuracy. The fuel was carefully weighed, and the gas measured directly into a holder specially set apart for the purpose. The figures represent not what it is possible to obtain, but what is secured in general working, employing one man only to operate the plant, and taking into consideration the unavoidable loss of fuel in the process of clinkering. The only figure which has not been actually found directly is the fuel which is required to raise the steam for the plant, including the fan. However, I do not think that the calculated figure taken is greatly in error. The calorific value of the gas was obtained by calculation from the average of a large number of complete analyses. The calorific value of the fuel was obtained by determinations in the bomb calorimeter.

Test "A."

Fuel used	Coke
Gas made per ton	48,250 c.ft.
Analysis:	
CO_2	6·2
O_2	0·4
CO	38·2
C_nH_m	*Nil*
CH_4	1·4
H_2	47·0
N_2	6·8
	100·0

Calculated calorific value = 290 B.Th.U. per c.ft.

HEAT BALANCE.

Heat Supplied.	B.Th.U.	*Heat Recovered.*	B.Th.U.
Coke 1 ton	26,200,000	Gas 48,250 c.ft. at 290	14,000,000
Fuel for steam and fan 700 lbs.	8,500,000	Sulphur, taken at 8 lbs.	32,000
	34,700,000		14,032,000

Thermal efficiency of gas production = 40·5 p.ct.

Test "B."

Fuel used	80 p.ct. coke, 20 p.ct. coal (intermittent working)
Gas made per ton	45,000 c.ft.
Analysis—	
CO_2	8·0
O_2	0·2
CO	33·6
C_nH_m	*Nil*
CH_4	3·5
H_2	49·6
N_2	5·1
	100·0

Calculated calorific value = 305 B.Th.U. per c.ft.

HEAT BALANCE.

Heat Supplied.		*Heat Recovered.*	
1 ton mixture—		Gas 45,000 c.ft. at 305	13,700,000
$\frac{1}{5} \times 28,200,000$ / $\frac{4}{5} \times 26,200,000$	26,640,000	Sulphur	32,000
		Tar	168,000
Fuel for steam raising and fan	8,500,000		
	35,140,000		13,900,000

Thermal efficiency of gas production = 39·4 p.ct.

Test "C."

Fuel used	50 p.ct. coke, 50 p.ct. coal
Gas made per ton	54,000 c.ft.
Analysis:	
CO_2	4·2
O_2	0·4
CO	38·7
C_nH_m	0·3
CH_4	4·0
H_2	44·2
N_2	8·2
	100·0

Calculated calorific value = 316 B.Th.U. per c.ft.

HEAT BALANCE.

Heat Supplied.		*Heat Recovered.*	
1 ton mixture:		Gas 54,000 c.ft. at 316	17,100,000
Coke	12,500,000	Tar, 2 galls.	334,000
Coal	16,800,000	Sulphur	32,000
Fuel for raising steam and driving fan	8,500,000		
	37,800,000		17,466,000

Thermal efficiency of gas production = 45·6

Test "D."

Fuel used	Coal.
Gas made per ton	53,500 c.ft.
Analysis—	
CO_2	5·0
O_2	0·4
CO	35·6
C_nH_m	0·5
CH_4	5·6
H_2	46·2
N_2	6·7
	100·0

Calculated calorific value = 333 B.Th.U. per c.ft.

HEAT BALANCE.

Heat Supplied.		*Heat Recovered.*	
1 ton coal	33,600,000	Gas 53,500 c.ft. at 333	17,800,000
Fuel for raising steam and driving fan	8,500,000	Tar, 5 galls.	835,000
		Sulphur	32,000
	42,100,000		18,667,000

Thermal efficiency of gas production = 43·2 p.ct.

The generator was charged every two hours, and the average amount of fuel required was 960 lbs. If we assume that 12,000 c.ft. of coal gas of 500 B.Th.U. per c.ft. are evolved per ton, then the amount evolved in two hours would be 5000 c.ft. The average make of gas per hour was 11,000 c.ft.—*i.e.*, 22,000 c.ft. in two hours.

The gas would consist of 17,000 c.ft. of water gas at 290 B.Th.U. and 5000 c.ft. of coal gas at 500, whence the calculated calorific value would be 337 B.Th.U. per cubic foot. [The above results are tabulated overleaf.]

From data supplied by a gas undertaking "X," I have worked-out the following heat balance:

Heat Supplied.		*Heat Recovered.*	
Coal, 1 ton	30,000,000	Gas, 52,000 c.ft. at 320	16,640,000
Fuel for steam raising, &c.	7,300,000	Tar and sulphur taken as	2,000,000
	37,300,000		18,640,000

From which the efficiency of gas production = 47·0 p.ct.

During the period for which the Tully plant figures have been

Table of Results.

Test.	"A."	"B."	"C."	"D."
		Intermittent Working.		
Fuel used	Coke	20 p.ct. coal 80 p.ct. coke	50 p.ct. coal 50 p.ct. coke	Coal
Hours worked	100	100	100	100
Fuel used . . . tons	21·5	22·3	23·65	25·8
Gas made . . . c.ft.	1,037,000	1,002,000	1,250,000	1,380,000
Gas made per ton	48,250	45,000	54,000	53,500
Calorific value B.Th.U. per c.ft.	290	305	316	333
Therms per ton	140	137	171	178
Therms per ton, ash-free fuel	174	167	188	184
Analysis:				
CO_2	6·2	8·0	4·2	5·0
O_2	0·4	0·2	0·4	0·4
CO	38·2	33·6	38·7	35·6
C_nH_m	*Nil*	*Nil*	0·3	0·5
CH_4	1·4	3·5	4·0	5·6
H_2	47·0	49·6	44·2	46·2
N_2	6·8	5·1	8·2	6·7
Thermal efficiency of gas production	40·5	39·4	45·6	43·2
Wages . . . . £	5·625	5·625	5·625	5·625
Cost of fuel for plant	28·500	28·880	29·350	29·700
Cost of fuel for steam and fan	3·350	3·483	3·700	4·000
Total cost . . . . £	37·475	37·988	37·675	39·325
Cost per 1000 c.ft. in pence	8·65	9·10	7·35	6·84
Cost per therm in pence	2·99	2·98	2·29	2·05

Goodall-Clayton intermittent verticals in operation at Ossett—

Coal carbonized	224 tons
Hours worked	168
Cost per 1000 c.ft.	10·2d.
Cost per therm	2·04d.

All the above costs are the costs of manufacture only, and do not include distribution costs, management, &c.

given, an attempt was made to enrich the gas by the addition of creosote oil. For this purpose the oil is injected through small nozzles situated just below the chequer brickwork. The injector nozzles were in a short time blocked-up; and in consequence it was decided to carburet on the down run, injecting the oil through the top of the generator.

One gallon of oil per 1800 c.ft. of gas made was injected.

Analysis of gas:

	Before Carburetting.	After.
CO_2	9·0	8·0
O_2	0·2	*Nil*
CO	32·4	33·8
C_nH_m	*Nil*	*Nil*
CH_4	3·8	3·5
H_2	47·5	49·6
N_2	6·7	5·1

These figures were the average of many analyses, so that it was obvious that the enriching effect of the oil was not very great. Situated near the wash-box is a small tap, which the operator would light in order to see that the process was proceeding satisfactorily. Naturally, if the oil is vaporized temporarily, the flame will be luminous; but this is no evidence of cracking. In general, I think it is not an easy matter to crack the heavy constituents of tar in a Tully plant. This statement is borne out by a recent statement by Mr. Shadbolt, who could obtain no beneficial results in the endeavour to enrich the gas with creosote oil.

In the complete gasification plant of Mr. F. H. Robinson at Harrogate, a large chamber is provided, into which the gases evolved from the coal during the period the blow is taking place find an exit. No such provision is made in the Tully plant. The only outlet for the gases is through the nostrils and into the chequer brickwork, whence they will pass away with the blast gases through the snift valve. This, however, does not represent a dead loss, as the heat can in part be utilized by allowing sufficient secondary air to burn the gases, as well as the carbon monoxide produced in the generator. Referring to the paper in 1905, the tar vapours were utilized in a similar manner.

With regard to labour, the Tully plant requires far less than a coal-gas installation, and there is also less dependence upon any particular class of labour. When regarding the thermal efficiencies of gas production quoted above, one must bear in mind the relatively large percentage of the total heat units in the coal obtained in the form of gas—a form of heat energy having high efficiency of utilization and adaptability.

Finally, I would like to say how much I appreciate the kindness shown and assistance given by my Chief (Mr. Arnold E. Mottram), who placed at my disposal the plant for these tests.

[The report of the ensuing discussion is held-over until next week.]

Illuminating Engineering Society.—Lack of available space unfortunately compels us to hold-over until next week the report of the meeting of the Society on Dec. 12, at which Mr. Haydn T. Harrison opened a discussion on "Recent Developments and Modern Requirements in Street Lighting."

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Visit to Kirkcaldy Gas-Works.

Last Saturday week, the 9th inst., about forty members of the Association availed themselves of the opportunity afforded of visiting the Kirkcaldy Gas-Works. The party was conducted on the tour of inspection by Mr. M'Donald (Chief Assistant) and Mr. Shand. Most of the time was spent in the examination of the new bench of Woodall-Duckham vertical retorts, a description of which was later given by Mr. M'Donald in a paper. The members were highly delighted with all the working arrangements; and Mr. James Kincaid (the Engineer and Manager) and his staff were complimented on the complete and up-to-date carbonizing plant they possess.

Mr. KINCAID, in welcoming the members to Kirkcaldy, said that it was a great pleasure to see such a satisfactory turn-out. The object of the Association was very praiseworthy, in that it gave younger members a good chance of gaining more knowledge, and a better idea of working methods other than their own. He wished the Association every success.

Mr. W. A. DEARDEN (Dunfermline) expressed the thanks of the Association to Mr. Kincaid, the Kirkcaldy Corporation, and the gentlemen who had conducted them over the works. He thought Kirkcaldy now had one of the most up-to-date carbonizing plants in the country.

By the kindness of Mr. Kincaid, the members were entertained to tea, and subsequently

Mr. A. M'DONALD (Kirkcaldy) read the following paper.

RECONSTRUCTION AT KIRKCALDY GAS-WORKS.

As you will observe, considerable reconstruction has been carried out since your last visit to Kirkcaldy. It is with some of the changes that I shall deal with briefly.

The old carbonizing plant now displaced by the Woodall-Duckham system of vertical retorts consisted of two horizontal retort-houses, one containing five ovens and the other eight ovens. Each contained eight retorts 9 ft. 6 in. long by 21 in. by 15 in. D section. The capacity of this plant was 950,000 c.ft. per day. We had no stoking machinery; all stoking being done by hand. It will be obvious that with the introduction of more modern methods of carbonizing in other places, Kirkcaldy could not be said to be an up-to-date gas-works. This is now a thing of the past, as far as carbonizing plant is concerned.

The maximum daily make reached with the horizontals was 733,000 c.ft., which was in 1913-14. Since then, through war conditions and perhaps the price of gas, the maximum daily make has been less. We are again increasing, and shall pass the figure of 1913-14 in the near future.

In 1920 the Town Council decided, on the recommendation of my chief (Mr. Kincaid) to begin a reconstruction scheme. The immediate part of this included the following: A 1-million per day installation of vertical retorts complete with house, boiler-house, steam boiler and setting.

The site on which the Woodall-Duckham vertical retort plant now stands was formerly occupied by a coal-store and a dwelling-house. These, with the exception of one side wall, were demolished, and the ground lowered to the proposed level of the new retort-house.

The side wall on the west side had to be strongly built, as the ground level outside the retort-house is at a higher level, on which has been formed the main roadway for cart and motor traffic. The details of this wall may be interesting to you. It is built of masonry on a concrete foundation 5 ft. wide by 1 ft. 6 in. deep, and extends for a distance of 86 ft. For a distance of 48 ft. it is 14 ft. 6 in., and for 38 ft. it is 7 ft., above the retort-house floor level. The wall at the base is 3 ft. 6 in. thick, and is stepped-up at varying heights to within 14 in. of the outside road level, where it ends 2 ft. thick. The 7 ft. part is stepped in a similar manner, but finishes a little below the road level, where it is 2 ft. 6 in. thick. This was done so that only brick would appear above the road level. To strengthen the wall at the joining between the higher and lower portions, also at the end next the receiving hopper, counterforts were built into the walls and stepped in the same way as the retaining wall. The wall heads were prepared to receive the retort-house stanchions by means of fourteen concrete pads, 2 ft. 6 in. by 2 ft. by 1 ft. 6 in. deep, formed *in situ*, to which the 2 ft. square base plates of the house stanchions were secured by holding-down bolts.

My chief had serious doubts as to the nature of the ground on which the vertical retort plant was to be erected. A firm of boring engineers were engaged to prove the nature of the subsoil. This was a wise step, as the results of the boring confirmed the doubt entertained regarding the ground. Altogether twelve bores were made on the proposed site of the plant at points on which the main foundations were to rest. The boring result showed that there was sand at depths below the proposed retort-house floor level of from 2 ft. 9 in. to 10 ft., and at depths from 7 ft. to 14 ft. a waste existed of a depth varying from 3 ft. 4 in. to 12 ft. The roof and floor of the waste consisted generally of blaes, fireclay, and fakes. This waste is an old coal working which had an "in-gaun-e'e." This state of matters exists under a considerable part of Kirkcaldy proper. The waste travels longitudinally beneath the retort-bench at one side, and as far as could be learned

is a secondary one. The main working or waste runs below the present adjoining coal-store.

The retort-house floor level is 22 ft. above ordnance datum; and the high-water mark of ordinary spring tides is 8 ft. 9 in. above ordnance datum. We thus found that certain parts of the waste were below ordinary tide level. This entailed a considerable amount of pumping during the construction of the foundations.

On the results provided by the bores suitable foundations were planned. They were designed for the Woodall-Duckham Company, Ltd., by foundation experts, and are of reinforced concrete piles made on the Hennebique system. The piles are 14 in. square, and the reinforcement in each consists of four 1¼ in. diameter iron bars, which are tied together by means of cast-iron forks and 3·16 in. links. On the bottom of each was a pointed shoe for driving. The top of the piles had a helmet for protection during the driving. The piles were driven by means of 30 cwt. monkey falling a distance of 3 ft.

The design provides for a total weight on the foundations of 1836 tons. This weight is distributed in twelve concentrated loads of 103 tons, and four of 150 tons. Each pile carries a load of 51½ tons. Two piles are therefore placed under the stanchions which carry a load of 103 tons, and three piles under the stanchions which carry a load of 150 tons.

During the excavation for the breaker pit, it was discovered that the walls of the coal-store on the works side of the vertical retort site had not a very good foundation. This necessitated special precautions being taken during the driving of the piles. If the piles were driven in the ordinary way until the required set was obtained, it was considered that when they reached the hard strata of the roof of waste, serious damage might have been caused to the building. To obviate this, the adopted method of piling was as follows: Rectangular pits were sunk through the sand, blaes, &c., at the positions to be occupied by the various groups of piles. These pits were carried down to within a short distance of the roof of waste, and were close timbered to prevent the soft strata from slipping, and thus obviating any movement occurring under the wall foundations. A hole just large enough to admit the piles was then made in the roof. The piles were then passed through the holes, and rested on the floor of the waste. They were then driven by the piling machine until the required set was obtained—namely, ½ in. in the final ten blows, with 30 cwt. monkey falling 3 ft. Twenty piles were driven through the waste in this manner. In all thirty-three piles are driven to depths varying from 16 ft. to 22 ft. below the retort-house floor level. In one position rock was found; and there being no waste, concrete pillars 7 ft. by 3 ft. in cross section were utilized.

A reinforced concrete slab, 30 in. wide by 14 in. deep, runs across the top of each row of piles; the two rows of slabs being bound together with four reinforced concrete cross ties 10 in. wide by 14 in. in depth. On these the retort-bench stanchions stand.

The weight of the chimney is 225 tons, and the equivalent wind moment is 285 tons—a total of 510 tons. It stands where a deep and wide portion of the waste existed. The chimney is not piled, but is built on an octagonal concrete foundation 3 ft. by 2 ft. by 9 in. in cross section, with an earth filling of 5 ft. 9 in. in the centre, and is carried up from the solid rock. A reinforced concrete cap 18 in. deep placed on the top forms the foundation.

Each retort-house gable is carried on two piles 12 in. square.

The retort-bench consists of four settings of four retorts of the 5½ ton type, and each setting is provided with a stepped-grate producer and a regenerator. At the clinker stage level, steam superheaters are arranged which pass through the bottom of the setting, and the superheated steam is then introduced into the retort by means of firebrick nostrils at the clinker stage level. The coke from the retorts is discharged into skips running on 2 ft. gauge rails. The extractor gear is driven by 3 B.H.P. National gas-engines in duplicate.

The coal is brought in by carts or motor lorries, which pass over an Avery's 15-ton weighing machine with a 16 ft. by 8 ft. platform placed on the new roadway, and is discharged into a steel receiving hopper, the top of which is 9 ft. above the retort-house floor level. From the receiving hopper the coal is fed, by means of a jigging screen, through a Jeffrey single-roll coal breaker of 25 tons per hour capacity; or, when using doubles or trebles, the breaker is bye-passed and the coal passes through a rotary filler into the buckets of a Babcock and Wilcox gravity-bucket conveyor. The gravity-bucket conveyor is of 25 tons per hour capacity, and elevates the coal to the overhead storage hopper level and delivers it, by means of a travelling two-way shoot, into the various compartments. The coal breaker, jigging screen, and conveyor are driven by means of 26 B.H.P. National gas-engines in duplicate. The coal-store can be filled from the overhead hoppers by means of three extension shoots, which pass through the east wall of the retort-house and through the roof of the adjoining coal-store. In case of a mishap to the conveyor, coal would be taken up in the skips by the lift.

The coke for the producers is taken up in the skips to overhead storage hopper level by means of a 25 cwt. electrically-driven lift, the motor of which is 12½ H.P. with direct current of 440 volts taken from the town supply. The skips run on 2 ft. gauge rails along this level, and are discharged into the various bunkers.

The coke for sale is taken up in the lift to the coke gantry level, and the skips are run out on rails and emptied into the yard. Should the lift fail at any time, coke can be discharged from the skips into the small receiving hopper on the retort-house floor level, and through the bye-pass shoots into the conveyor. Coke can thus be elevated to the overhead storage level, and delivered into the various bunkers. A fixed shoot is provided at the top run of the conveyor in the end bay of the retort-house, and extends through the retort-house gable into the coke-yard, by which means surplus coke can be dealt with. The coal and coke overhead storage hoppers have a capacity of 48 hours' maximum consumption.

Although this paper is on reconstruction, it may be interesting to state that from Fife trebles and doubles 17,900 c.ft. of 475 B.Th.U. gas is obtained, equal to 85 therms per ton.

During the excavating for the boiler foundation, part of the old side wall was found unsafe, owing to the earth pressure behind and to its being badly founded. For this reason the wall is built of the same cross section as the wall of the new vertical retort-house. This wall is founded on rock. Also the workmen broke into a coal waste about 3 ft. down from the surface; and this entailed considerable reinforcement in the foundations. The setting is so arranged that another boiler can be placed alongside.

With the addition of cast-iron struts, old couples were utilized for the new roof.

The boiler is of the Lancashire type, 8 ft. diameter by 30 ft. long, and is fitted with a Goodrich and Hamlyn patent furnace. It was supplied by John Bryce, of Kirkcaldy. The mountings are all of the Hopkinson pattern. The main feed water for the boiler is pumped by means of a Weir's direct-acting feed pump, capable of a continuous maximum duty of 12,050 lbs. of water per hour against the boiler pressure of 70 lbs. per sq. in. The pump draws its water supply from the same two overhead tanks that supply the two original boilers. The tanks can be fed by the town supply, or mine water can be pumped up in an emergency. As a stand-by to the boiler feed pump, a "Sirius" injector is installed. The two blow-off pipes from the safety valves are taken up through the roof, and are fitted with "Sentinels," so that the boiler attendant can easily see when the boiler is blowing. By building the main chimney flue a distance of 76 ft., a connection to the old retort-house chimney was obtained.

The first part of the reconstruction scheme will be completed by the erection of a new coal-store, plans for which are now being prepared; and we contemplate putting down in the near future sulphate of ammonia and tar dehydrating plants.

Discussion on the paper was lengthy and varied. The difficulties which arose during the building of the foundations were freely commented on; and admiration was expressed of the way Mr. Kincaid and his staff overcame them. The often occurring "wastes," or old coal seams, gave a good deal of trouble. Mr. Kincaid remarked that in the days of horizontal retorts, on one occasion some old pit-props in these disused workings had taken fire. It had hardly been possible to instal stoking machinery in the old horizontal retort-house. Water gas was considered; but it was decided to instal vertical retorts. Mr. M'Donald replied to points raised, and was heartily thanked for his contribution.

Rochester (N.Y.) Gas House-Heating Plan.

The announcement that a limited number of homes in Denver are to be equipped with gas-fired house heating apparatus, is followed by information from Rochester (N.Y.) that action along the same lines is to be taken there under conditions that will enable the Rochester Gas and Electric Corporation closely to study the results obtained. Efforts will be directed towards the development of a gas-burning furnace which will utilize to the utmost the fuel value of the gas. The idea is to instal furnaces in the homes of a number of employees, where they will be operated in conjunction with furnaces already in use. This arrangement will permit the gas-furnaces to be used during the greater part of the year, with the alternative of bringing the coal-burning units into operation during the periods of severe cold weather, when the heavy demand might make it impracticable to use gas alone.

The Levey Hot Valve.

The Levey hot valve for use with water-gas sets, which is marketed by the Bartlett Haywood Company, of Baltimore, was described and illustrated in a recent number of the "Gas Age-Record." This valve, which has been in service a sufficient length of time to prove its usefulness, is double-ported with a single valve disc—this disc alternately seating on the upper port (which connects the generator and carburettor) and on the port between the up-run connection of the generator with the carburettor. The valve disc is carried by a ring which, when the upper port is open, makes a continuous passage for the blast gas from the generator to the carburettor, when blowing the sets. The valve disc is brought to a positive seat by means of adjustable rollers which engage with wedges on the valve disc, the adjustable rollers making it possible at all times to bring the disc to a positive bearing on the valve seat. The same disc is used to close the lower port, the adjustable wedge engaging with the roller carried on the disc. To obviate failure of the valve due to temperature, the body proper and the ring carrying the disc are made of cast steel. These parts are further protected by an insulating firebrick lining. With the Levey valve, as either the upper or the lower port must be open, the valve is at all times safe against any back-pressure in the generator, due to inadvertently closing both connections to the carburettor. One of the advantages claimed for the valve is additional length of life.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

A Discussion on Water Heating by Gaseous Fuel.

A well-attended meeting of members was held last Saturday week, in the Royal Technical College, Glasgow—under the presidency of Mr. W. J. Lennox, of Falkirk—when Mr. ARCHIBALD KAY, of Glasgow, read a paper on "Water Heating by Gaseous Fuel," parts of which were reproduced on pp. 682-3 of last week's "JOURNAL." The paper was copiously illustrated by a series of excellent lantern slides.

The discussion which followed was opened by Mr. M'Isaac, and he, as well as the others taking part—Messrs. John Wilson (Motherwell), D. Fulton (Helensburgh), M'Ghie (Glasgow), James Cubie (Glasgow), A. B. Munro (the Secretary), and the President, gave interesting experiences regarding the use by them of geysers and hot-water circulators. While the discussion was general, it did not elucidate any point of outstanding interest as to the improvement of hot-water circulators. For the most part, the speakers confined themselves to a simple narration of their own personal experiences with various types of apparatus.

In the discussion, however, a good deal of stress was laid on an admirable suggestion Mr. Kay had put forward for the fitting-up of a hotel or a busy restaurant where a considerable quantity of steam was normally in demand. The general feeling was that a gas-heated boiler of equal capacity to the ordinary steam-boiler was a decided acquisition to hotels and large restaurants, because of the limited space it occupied. Most of the speakers agreed that it was a type of apparatus that ought to be popular in such institutions, as experience had shown that the gas-boiler, while equally efficient in every way to the huge steam-boilers that were frequently in use, was easy to operate, and afforded an immense saving in space. The discussion in the main was interesting; and Mr. Kay's admirable pictures, showing a varied assortment of geysers and circulators, were quite an education.

At the close, a warm vote of thanks was accorded the lecturer.

AMERICAN GAS ASSOCIATION MEETING.

(*Continued from p.* 684.)

Gummy Deposits in Meters.

During the past year, the Deposits in Pipes and Meters Committee have given their entire attention to a study of the gummy and resinous deposits occurring in many meters; and a progress report was presented by the Chairman, Mr. Ralph L. Brown (Organic Chemist to the United States Bureau of Mines), who said it contained much that might be considered tentative and based on a limited amount of evidence. The work so far has been largely confined to systems, and to materials from systems, distributing carburetted water gas, or water gas mixed with less than 50 p.ct. of coal gas. This was done because, within the Chairman's experience, no system distributing coal gas has shown any serious trouble due to gum. The basis of the gum formation was felt to be the unsaturated hydrocarbons present in the gas. In all gums formed naturally, as found in meters, meter drainings, and natural condensates—*i.e.*, drip oils—oxygen was present up to 30 or 35 p.ct.; and this fact, together with others, including the simple carbon-hydrogen relationship of the gums, made it evident that autoxidation must be playing a rôle in the gum formation that could not be neglected. Hydrocarbons—and particularly the unsaturated ones—have long been known to take up oxygen from the air or other gaseous mixtures containing it. Some sulphur compounds undergo autoxidation; and sulphur will, within limits, assume the rôle played by oxygen in autoxidation of hydrocarbons. The source of oxygen is believed to be the air introduced into the gas; but besides this it is obvious that the presence in a meter of gum-forming constituents is a requisite factor.

On the basis of the evidence so far before them, the Committee concluded that the present-day higher oxygen content in manufactured gas—particularly carburetted water gas—is a factor in the gum trouble in meters; that the presence in meters of natural condensate which has been found to be highly unsaturated and of gum-producing properties, is a definite factor, both directly and indirectly, in gum formation; and that the high rates of oil input as practised to-day in the generating equipment of many plants give rise to incomplete cracking of the oil, and are productive of gum trouble. Therefore it is suggested that the excess oxygen content of the gas should be cut-down to a minimum; and that attention to complete tar removal ahead of the purifier boxes, proper gas rate flow through the boxes, and general care of the oxide and boxes should be helpful. For cutting-down the gum-forming constituents in the delivered gas, a number of ways naturally suggest themselves. In systems using compression, it would seem specially desirable to keep the oxygen content of the gas low. The rate of oil input with the present installations should not be too high.

The Committee feel that the investigation should be continued. It is essential that the chemical study of gum-forming constituents in the gas be carried to completion, as that phase of the inquiry is the fundamental basis upon which intelligent study of the whole problem of gum trouble must be based. This, also, is the only sure basis upon which to develop practical tests. In other words, there should be established more definite and proved relationships between routine tests on tar, drips, &c., and the presence of serious quantities of gum-forming constituents in the gas.

Increasing Consumption by Gas-Ranges.

Telling of her experience as an official of the Home Service Department of the People's Gas Light and Coke Company of Chicago, Mrs. Anna J. Peterson, in a paper entitled "Home Cooking Makes Gas Sales," said she found, on taking over the work, that 60 p.ct. of the gas sold in Chicago was used through gas-ranges, but that 70 p.ct. of the domestic consumers were served at a loss to the Company. This convinced her that a vital problem of the Company at the present time is how to increase the gas consumption in the home through greater use of the gas-range. The average consumption of gas for each customer in Chicago is 2500 c.ft. per month. If a family who have been in the habit of serving a prepared breakfast food can be induced to take oatmeal, by this one small change an increase of (say) 7 c.ft. of gas per day is gained, which amounts to 200 c.ft. per month, or exactly 8 p.ct. of the average family's consumption. Think what it would mean to the domestic accounts if they could be raised 8 p.ct. per month! One small process worked-out for the use of gas may mean the sale of millions of cubic feet of gas annually. The series of lecture-demonstrations inaugurated in Chicago have been attended by more than 20,000 women during the last seven months; and she finds that they are willing to be led to take a greater interest in cooking.

Value of Newspaper Advertising.

Mr. John F. Weedon is the Superintendent of Advertising for the People's Gas Light and Coke Company of Chicago, who are, he said in a paper entitled "Advertising Booms Appliance Sales," selling merchandise and appliances successfully at a profit. The Company's stores are doing this in direct competition with all the merchandizing skill to be found in a city of nearly 3 million inhabitants, where department stores and stores that specialize in complete household equipment are more highly developed than anywhere else in the United States; and they are doing it without price-cutting, or any other expedient that might be called unfair or unethical. The cause of this is largely advertising, intensively and consistently employed as part of a definite plan. This is evident because the conspicuous success of the Company's stores has come since advertising became a major item in the programme. The importance of the advertising being "continuous and intensive" was emphasized; and by intensive the author explained that he meant "a close, continuous, persistent practice of publicity, using every medium possible that offers a reasonable prospect of increasing our business and improving our relations with our customers, and selecting advertising mediums with an eye always to making returns justify expenditure." No form of merchandize advertising is equal to, or a substitute for, newspaper advertising. It not only assists to sell goods, but incidentally helps to build-up general goodwill. The use of newspapers, however, need not, and should not, prevent the utilization of other mediums to supplement the newspaper. It is of extreme importance to a gas company that their customers should be using only up-to-date approved appliances; and company management should consider its merchandizing as seriously as it does its engineering and legal problems.

(*To be concluded.*)

Drogheda Gas Undertaking.

During a discussion in the Drogheda Corporation on the Gas Committee's administrative work, the Mayor (Alderman P. Monahan) observed that the Committee simply sold gas and recorded the money they got for it. The Corporation, though responsible for the lighting of the town, were only a customer of the Gas Committee, and had neither a greater nor a less interest or claim upon the Committee than any other customer in the town. The question might arise as to where the control of the Corporation over the Gas Committee did come in. The Committee furnished a detailed statement of their accounts to the Finance Committee. Alderman J. E. Murphy said the Gas Committee had brought the works from absolute insolvency and hopelessness into what might reasonably be called a sound financial condition. Mr. M'Cabe observed that he had only raised two points. They had a great saving of gas one year, because, owing to British military (curfew) operations, there was no gas being used in the town at all; and he wanted to know whether there was a credit balance brought forward in respect of that period by the Finance Committee. Secondly, could not the Committee, in view of the saving, afford to give more for public lighting now? The Mayor, replying, held that the report of the Auditor was eminently satisfactory and reflected great credit on Mr. P. J. Fitzpatrick (the Manager), the staff, and the Committee. When the present Corporation entered office, they found that the gas-works accounts showed a deficit of over £3000; while at March 31 last the cash at the bank was £6617. Of course, in the meantime, the price of gas and of coal went up, and so did the cost of labour; but the price of gas had now been reduced to 6s. 8d. per 1000 c.ft., and 6s. to the largest consumers. The figures would admit of a further reduction later, if all went well. There had been a distinct progress in the output of gas per ton of coal. In 1920 it was down to 9000 c.ft; whereas for the year under discussion there were 12,602 c.ft. produced per ton, of which 10,877 c.ft. were sold to consumers. If memory served him, there was not a single year in which there was not public lighting, nor was there one in which they did not spend on such lighting the amount estimated for the purpose.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The "Largest" Gasholder in the World.

SIR,—We noticed by the illustration that appeared in the "Daily Mail" of the 9th inst., that America was about to break another record in constructing the largest gasholder in the world at San Francisco, which is to contain 10 million c.ft. It is unnecessary for those in the trade to be informed that for 25 years a gasholder containing 12 million c.ft. has been operating in London. Some few weeks back they also made the statement that the largest gasholder in the world was being erected at Belfast, to contain 7 million c.ft. of gas. They were very ambiguous in this statement, for the Belfast gasholder is the largest spiral holder in the world, but, of course, not the largest gasholder.

It is a pity that a paper professing to give reliable information should make statements of this character without being guided by some technical expert. But we know it would be useless to write to the paper and point this out, for in other cases they have refrained from inserting the correction. This latter statement of theirs induces us to refer to their previous misstatement, for it has been rumoured that the paragraph regarding Belfast in the "Daily Mail" was inspired by ourselves.

Hoping you will give us space for the above in your next issue.

Gas-Plant Works, Manchester, Dec. 12, 1922. R. & J. DEMPSTER, LTD.

[Reference was made to the "Daily Mail" illustration in last week's issue, p. 673.—ED. "G.J."]

REGISTER OF PATENTS.

Burner for Gaseous Fuel.—No. 175,962.

SCHULMEYER, J., of Frankfurt a/M., and HILDMANN, P., of Klein-Schwalbach.

No. 1293; Jan. 14, 1922. Convention date, Feb. 25, 1921.

The usual methods of increasing the calorific value of a gaseous fuel by the addition of air under pressure are based upon the injection of an air jet in the direction of flow of the gas jet under pressure. By the superior kinetic energy and velocity of the air, the gas jet is drawn along and forms as it were the core of the stream of air. In any case, says the patentees, the two fluids are not thoroughly mixed, and the increase in the calorific value of the gas does not correspond to the expense of adding air under pressure.

According to their invention, the gaseous fuel and the air are conducted in counter currents, so that the two fluids admix very intimately and the heating effect is considerably increased. They claim to effect this by a burner comprising in combination with the burner head and with the burner pipe, into which compressed air is fed and flows towards the burner head, a gas supply pipe extending radially into the burner pipe and having an outflow opening for the gas at the side remote from the burner head, so that the gas flows out in a direction opposite to that of the air and is intimately mixed with it.

Incandescent Burner.—No. 188,015.

BRETT, C. G., of Wimbledon Common, S.W. 19.

No. 17,327; June 24, 1921.

This invention, which relates to gas-burners of the bunsen type with inverted incandescent mantles, seeks to avoid the unsatisfactory results of leaving independent gas and air regulation in the hands of the consumer. The method adopted is set out in the claims, which provide for a bunsen type gas-burner, for use with an inverted incandescent mantle, comprising a gas inlet nipple having an invariable orifice of predetermined size, invariable inlets for air, a fixed tubular mouthpiece having an inturned flange at its lower end pierced with holes for the exit of the mixed gas and air, a regulating sleeve mounted outside the fixed mouthpiece, having a similar flange similarly pierced, and means for turning the sleeve relative to the mouthpiece to effect the regulation of the register of the holes. The two flanges are each provided with a central hole; and the regulating sleeve is provided with means for supporting an incandescent mantle.

Manufacture of Gas.—No. 188,073.

YOUNG, D. J., of Tacoma, Washington.

No. 20,612; Aug. 2, 1921.

This invention has reference to the manufacture of carburetted water gas, particularly to a modification whereby the carburettor and the superheater are freed of deposited carbon by the action of steam, converting it into gaseous oxides of carbon. Briefly stated it consists in adding to the usual water-gas plant means whereby coal, lignite, or an analogous raw fuel may be charged into the generator, and other means whereby steam, after passing through the superheater and the chamber which during the other part of the process serves as a carburettor, may be passed through the plant in a direction reverse to that usually employed. The plant is also provided with a gas off-take at the generator.

In carrying out the process, the blasting run is carried to a point where the checkerwork in both the carburettor and the superheater is raised to a somewhat higher temperature than would be required by the operation of the usual water-gas process. Instead of following this blasting operation by the usual gas-making run, in which steam is first passed through the fuel bed in the generator, steam is introduced from a pipe at the top of the superheater. This steam is passed in a reverse direction to that usually employed, passing first through the superheater, thence through the carburettor, and finally through the incandescent fuel in the generator where it is decomposed; the resultant water gas being taken out at the extra off-take pipe supplied. This steam absorbs heat from the superheater and the generator until it is highly superheated, and when it reaches the generator comes in contact with coal or other fuel. The steam is sufficiently hot to volatilize some of the constituents of the coal—particularly if the coal is very finely powdered. The result is the formation of a considerable amount of coal gas, which is passed through the incandescent fuel and discharged through the extra pipe.

The steam in passing through the superheater and the carburettor comes in contact with any carbon deposited therein during the operation of the plant in the usual manner of a water-gas plant. This carbon, being highly heated and incandescent, combines with the steam to form gaseous oxides of carbon; thus securing two desirable results—one the utilization of this carbon for the making of gas, and the other the prevention of clogging of the superheater and the carburettor with carbon. The superheated steam is also further acted upon by the incandescent fuel bed of the generator to produce more water gas. The gas produced during this run of the apparatus is a combination of coal gas and water gas.

When the superheater and the carburettor have, by such a run as just described, been reduced in temperature to that which is most desirable for the operation of a water-gas plant, this flow of steam is cut off and the usual water-gas operation through the fuel bed in the generator is commenced. During this run the supply of coal to the generator is discontinued, and the supply of oil to the carburettor commenced. When the fuel bed has been reduced in temperature to the minimum desirable, the make is stopped and the blasting run started in the usual manner.

It is unnecessary to make down runs such as are commonly used in standard operation, and, therefore, certain valves and a bye-pass pipe ordinarily employed may be omitted. The specification describes an addition suitable for the introduction of powdered coal.

Regulator for Incandescent Burner.—No. 188,089.

CHARLES, W. J., of Birmingham.

No. 21,316; Aug. 11, 1921.

The kind of regulator to which this invention refers is one having an up and down moving member working within the interior of the regulator body, and carrying a conical peg to operate in conjunction with the gas outlet hole; this member being actuated by hand revolution of a small shaft transversely applied to the body. The inner end of this shaft is screw-threaded for engagement with a connector which is traversed across the interior of the regulator body and at its lower end has a pin engaging an inclined slot in the up and down member which carries the conical peg.

According to the invention the moving member is provided with a web crossing the regulator body and having through it the inclined slot. At the base of the web there are two rigid transverse arms near the peg; and the edges of the web and the outer ends of the arms contact the bore of the regulator body and thereby centrally support and guide the member in its up and down movement.

Gas-Fires.—No. 188,179.

HASSALL, W., of Woodville.

No. 27,753; Oct. 19, 1921.

No. 16,895; June 19, 1922.

This invention relates to gas fireplaces and gas-fires for domestic use, and its main object is to obtain greater economy and efficiency in working and in the consumption of gas, and at the same time to ensure that the burnt gases do not contaminate the air in a room. A further object is to secure a better distribution of the heat, without risk of its being over-concentrated upon particular spots. Finally, improved ventilation is aimed at, by drawing air in sufficient quantities up the flue together with the products of combustion.

The specification illustrates and describes several modifications of gas-fires constructed according to the invention, the main points in which are emphasized by the claims.

The gas-fire or fireplace has a back of refractory material presenting plane surfaces arranged one above the other at different angles, the lowermost surface being heated directly by a gas-heated body in front of it, and the several surfaces co-operating with the hot gases rising towards the flue. One characteristic is the insertion against the back of a "rest brick," which has a top which slopes down towards the front of the fire, the radiant bodies resting upon the sloping surface and the base of the brick resting upon a box in which are contained the gas pipe and burners. This box has a raised lip or baffle for intercepting the intense heat at the lower front edge of the row of radiant bodies.

There may, in combination, be provided an upper tier of radiants, arranged substantially upright and heated by gas-burners located (preferably in grooves) behind (or inside) the rest brick.

Dry Gas-Meter with Metal Diaphragms. No. 188,395.

ROUX, M., of Berlin-Friednau.

No. 21,104; Aug. 9, 1921.

To avoid the disadvantages known with dry gas-meters provided with leather diaphragms, it has already been proposed, says the patentee, to use metal diaphragms; but such diaphragms possessing internal stresses which have to be overcome by the gas pressure, gives rise to undesir-

able loss of pressure in the conduits leading to apparatus. The object of the invention, therefore, is to construct a dry meter with metal bellows the stresses in which are compensated. With this object in view, the invention consists in a meter having three gas-measuring chambers, formed by the casing of the meter and two metallic bellows therein; the gas inlet and gas outlet being controlled by a valve operated through the medium of a crank gear with link motion connected with the bellows. The connection is carried out in a manner known for bellows formed partly of leather and partly of metal, so that the stresses existing within the diaphragms of the one bellows in its return stroke into its position of rest—*i.e.*, its middle position—are used to subdue the stresses in the other bellows in its forward stroke; the gas pressure, therefore, having only to surmount the friction of the gearing. The gearing consists of a crank shaft having two cranks set at about 90°, and two links carried by the bellows and connected with the crank. When the bellows are inflated they rotate the shaft of the gearing so that the controlling valve for the gas distribution into the measuring chambers is set in operation and the counting mechanism is rotated.

Gas-Saving Device.—No. 188,462.

FERGUSON, D., of Glasgow.

No. 24,896; Sept. 21, 1921.

This invention has for its object to prevent firing-back in a gas-stove, and also to reduce consumption with equal efficiency.

The patentee is aware that it has been proposed to provide, in the mixing tube of a burner, a tapering spiral coil, with its taper portion directed towards the gas nipple, and also a conical adjustable nozzle formed of a coiled metal strip wherein a tapering passage for the gaseous mixture is formed. His invention provides a "gas saver" which consists of a coil formed of a spirally loosely-wound strip of steel or other springy metal of truncated cone-shaped formation, the centre space of which is divided into two by crossing the inner end of the strip over the centre; the coil being placed in the mixing tube of the burner with its taper portion directed towards the nipple.

Manufacture of Gases Rich in Hydrogen. No. 188,494.

WEST, J. H., of Bayswater, JAQUES, A., of Waterloo, and TULLY, C. B., of Newark-on-Trent.

No. 27,188; Oct. 13, 1921.

This invention relates to the manufacture of hydrogen, on gases rich in hydrogen, by a process of completely gasifying coal or similar fuel of a bituminous type.

According to the claims the process is characterized by the fact that the retort and producer portions of the apparatus are arranged in open communication with one another, so as to allow the carbonized coal to pass directly from the retort to the producer, that cracking of the vapours and gases produced during carbonization in the retort chamber is effected by passing them in a downward direction through the zone of highest temperature (1000° to 1200° C.) near that part of the fuel bed situated at the bottom of the retort portion and the top of the producer portion of the apparatus, and that the manner of admission and the quantities of steam and air employed are suitably regulated so that the temperature decreases gradually from the zone of highest temperature down to a temperature of comparatively low value (600° to 750° C.) at the bottom of the producer chamber, where the gases are drawn off. Thereby the two main reactions which occur—namely, the water gas reaction and the direct combustion of a portion of the carbonized fuel to oxides of carbon—are carried out in such manner as to favour in their final result the oxidation of the carbon to carbon-dioxide instead of to carbon-monoxide, so that the gases obtained contain a relatively high proportion of carbon-dioxide.

A considerable excess of steam, above that actually required to react with the carbon, is employed—for example, between 3 and 5 lbs. per lb. of carbon gasified.

The retort chamber is heated by the hot gases, obtained as a result of the process, passing through an external jacket surrounding the retort chamber; and the catalytic conversion of the carbon-monoxide in the gases to carbon-dioxide is assisted by the employment of suitable catalyst material therein, or by passing the gases, after leaving the jacket of the retort, through a separate apparatus containing suitable catalyst material. Additional steam is introduced into the jacket surrounding the retort chamber in order to assist the reaction of the carbon-monoxide with steam to form carbon-dioxide and hydrogen.

The fuel employed has a high ash content. The carbon-dioxide is removed from the mixture as a result of the process; and the hydrogen may be separated from the remaining constituents by a liquefaction system.

The specification also claims, and describes in connection with a drawing, suitable apparatus for the purpose of the invention.

Connecting Pipes of Stills.—No. 188,575.

CHINA, F. J. E., of Esher, and BURT, BOULTON, AND HAYWOOD, LTD., of London Wall, E.C. 2.

No. 34,846; Dec. 28, 1921.

The invention claims improved means for connecting one still with another, ensuring the uniform flow of fresh or added liquid through the bulk of the contents of a still, and preventing ill effects resulting from the possible generation of pressure in any one of the stills. The connecting means may either be employed for connecting together a series of stills, arranged initially to work individually and intermittently, so as to convert the series into a battery that will work as a whole and continuously for fractional distillation, or be used in substitution of connections that have been previously used in plant constructed in the first instance for continuous fractional distillation.

The connection between two stills comprises in each case an open-ended tee piece which dips into the contents of one still with its lower end near the bottom and its upper end opening above the level of the contents, and which communicates with an overflow pipe arranged to discharge into the next still.

Liquid flowing into the still can only pass out by travelling through the bulk of the contents, and passing up the dip pipe and thence through the connecting pipe. Therefore, every particle of liquid must be subjected to the temperature of the still for a time in passing from the outlet of the discharge pipe to the inlet of the next dip pipe.

Should a positive pressure be generated in one or more stills, the arrangement prevents the expulsion of the whole of the still contents, for the reason that the open upper end of the tee piece will only permit the liquid to be forced out until the level is at the level of the connecting pipe.

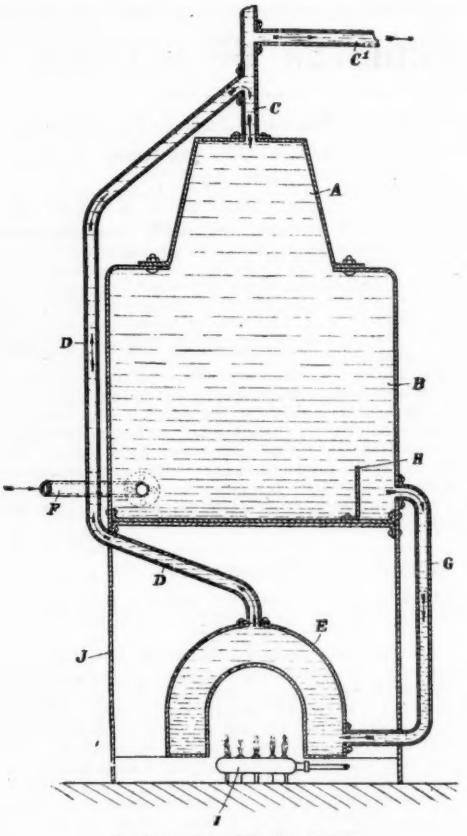
Water-Heaters.—No. 188,986.

AIRD, K., of Falkirk.

No. 33,124; Dec. 9, 1921.

This invention relates to that class of water heater in which the cold water is first passed to a circulating tank near the base and then to the boiler, from which it is passed direct to the cistern, when the outlets are open, or back to the circulating tank, when the outlets are closed; the connection from the boiler being made to a pipe leading from just above the circulating tank.

From the annexed drawing it will be seen that there is, according to



Aird's Improved Water-Heater.

the invention, a dome or chest A of smaller diameter than the circulating tank, provided above the circulating tank B and open thereto. This dome A is preferably of cone shape, but it may be of any other shape, and is small in size as well as diameter; and the top is connected to the pipe C leading to a cistern or taps, while the pipe D from the boiler E is led into the pipe C just above the dome A, at an angle thereto. The supply pipe F from the cold-water cistern is connected to the circulating tank B at one side near the bottom; and at the opposite side the supply pipe G to the boiler is connected, a baffle or baffles H being between.

The hot water coming from the boiler E by the pipe D will, on passing to the pipe C leading from the dome A to the hot-water supply, travel down into the dome A; and the portion of water contained therein will be rapidly heated, while the denser colder water in the main body of the circulating tank B will travel to the boiler E and in its turn be heated. Thus a small quantity of hot water can be drawn off by a delivery pipe C^1 positioned in the cistern supply pipe C, before the body of water in the circulating tank B is sufficiently heated.

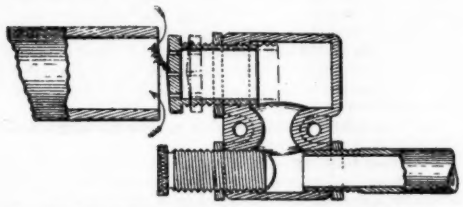
The boiler is heated by gas from a burner I (or other fuel); and it is preferred that the circulating tank be positioned on a frame J above the boiler. The water supply to the circulating tanks is as usual; and if a gas-burner is used for the boiler, the flame may be regulated by a thermostat.

Air Regulators for Atmospheric Gas-Burners.—No. 188,900.

CANNON IRON FOUNDRIES, LTD., and HAWTHORNE, H. S., both of Bilston.

No. 27,613; Oct. 18, 1921.

This invention relates to air regulators for atmospheric burners for gas-fires, gas-stoves, &c., and the object is to provide an improved and simplified form, which is efficient in action and readily operated. The construction of the complete fitting is clear from the horizontal section which we reproduce.



An Air Regulator by the Cannon Iron Foundries, Ltd.

The end of the main gas-supply pipe is connected to a short sleeve containing a gas regulating valve and having a passage in its walls leading into the side of a tubular chamber. This chamber is open at its one end and fitted with a gas nozzle or ejector, the latter being arranged in line with, and separated by a short distance from, the open end of the mixing chamber, so as to provide an inlet for the air which is drawn into the mixing chamber. The nozzle is axially adjustable within the tubular chamber, and is provided with a milled flange and a lock nut.

It will be noted that the gas valve, the screw of which is also fitted with a milled head, is arranged to lie in line with the supply pipe, as perfectly silent combustion is thereby obtained.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 13.]

Nos. 32,992 to 33,709.

CLEVELAND METAL PRODUCTS COMPANY.—"Adjustable support for burners, &c." No. 33,232.
COLEY, H. E.—"Gas manufacture." No. 33,432.
COMPAGNIE DU GAZ CLAYTON.—"Device for charging gas-generators, &c." No. 33,486.
COXON, J.—"Pressure regulating and reducing valves." No. 33,366.
DEMPSTER AND SONS, LTD., R.—"Valves for controlling flow of gas through purifiers, &c." No. 32,999.
FOWLER, C. R.—"Inverted incandescent gas burners." No. 33,499.
GILL, G. M.—"Furnaces, gas-producers, &c." No. 33,341.
GUNTON, A. W.—"Appliances for use in gas-ovens." No. 33,693.
HOLZWARTH, H.—"Explosion chamber for gas-turbines." No. 33,307.
HORSFALL, J. E.—See Dempster and Sons, Ltd., R. No. 32,999.
LLOYD, E.—"Apparatus for effecting intimate contact of gases and liquids." No. 33,532.
LUCKHURST, T. W.—"Atmospheric gas-burners for stoves." No. 33,686.
LUMB, H.—See Dempster and Sons, Ltd., R. No. 32,999.
LYMM, A. H.—"Utilizing coking fuel in gas-producers." No. 33,563.
MACLAREN, R.—"Automatic regulator for temperature control." No. 33,154.
MELDRUMS, LTD.—See Lloyd, E. No. 33,532.
OLDFIELD, G. H.—"Gas-cleaning apparatus." No. 33,296.
PINI, R.—"Gas-lighters." No. 33,089.
RADIATION, LTD.—"Gas cooking-stoves." No. 33,354.
REYNARD, O.—"Distillation of coal." No. 33,579.
SIMON-CARVES, LTD.—See Lloyd, E. No. 33,532.
SURFACE COMBUSTION COMPANY, INC.—"Producing and supplying proportioned mixture of gases." No. 33,469.
TAPPING, F. F.—See Reynard, O. No. 33,579.
TAYLOR, E. J.—"Photometer." No. 33,293.
TAYLOR, L.—See Oldfield, G. H. No. 33,296.
TETLOW, C. E.—"Welded pipe-joints." No. 33,368.
THORNLEY, F. C.—See Reynard, O. No. 33,579.
YATES, H. J.—See Radiation, Ltd. No. 33,354.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Gas Regulation Act.

On the motion of Lord Somerleyton, the House of Lords agreed to the drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act on the application of the Bridlington Gas Company, Burnham Gas Company, Chesham and District Gas Company, Harrow and Stanmore Gas Company, Kingston-upon-Thames Gas Company, Lea Bridge District Gas Company, Long Eaton Gas Company, and Sutton Gas Company. A similar motion was moved by Viscount Wolmer in the House of Commons, and approved.

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, on the application of the Borough of Middleton.

MISCELLANEOUS NEWS.

THE THERM INQUIRY.

[FIRST DAY.]

The proceedings before the Committee appointed by the Board of Trade "to inquire and report as to the method of charging for gas on a thermal basis," opened on Tuesday, Dec. 12, at the Institution of Civil Engineers. The Chairman of the Committee is Sir C. G. Hyde; the other members being Mr. Arthur Balfour, J.P., Sir James Martin, J.P., Mr. W. J. U. Woolcock, C.B.E., and Mr. A. Pugh.

A PROTEST AT THE OPENING.

Mr. J. HOPE, a private consumer, said it had been announced that the proceedings would be public, but the public had not been invited to attend. Looking around, he imagined the audience was composed mostly of gas managers and those interested in gas production.

The CHAIRMAN said that if the speaker would kindly reserve his protest until such time as it was necessary, it would be convenient.

Mr. HOPE replied that he wanted to state, as a consumer, his views from a public point of view.

The CHAIRMAN said that, in due course, representatives of the public would be invited to give evidence.

Mr. HOPE reiterated that they had not been invited. To cries of "Order" from the remainder of the audience, the speaker retorted: "I will not be shouted down by gas managers."

The CHAIRMAN brought the incident to a close by assuring those present that there was every desire on the part of the Committee to consider the position of the private consumer. He asked the speaker to wait until he found it necessary to make a protest against anything the Committee might do.

The CHAIRMAN, opening the proceedings, said that the Committee's terms of reference were wide. They proposed to consider the matter specially from the point of view of the consumer, both industrial and private. In the first place, official evidence would be taken as to how the therm system came into being. The Committee would inquire into the basis upon which the therm price had been built up, and would endeavour to ascertain whether or not that system, as now charged, was right, fair, and efficient to the general public; and on this basis they hoped to make their report. They trusted to have the assistance, not only of the gas companies, but of the railway companies, as large consumers, and the London County Council, representing the interests of the consumers. It was hoped, also, that either the various borough councils or any ratepayers' association, or any body that could fairly be said to be representative of the private consumer, would tender evidence; and if the Committee found they could get a body really representing the private consumer, they would be only too glad to hear their evidence.

EVIDENCE OF MR. H. C. HONEY.

Mr. H. C. HONEY (Director of Gas Administration, Board of Trade) then gave evidence. In the first place, he acquainted the Committee with the functions of the Board of Trade, who, he said, were entrusted with the general supervision of the gas industry. They initiated legislation, could make Orders for certain purposes, appointed a body of Gas Referees to prescribe the method of testing gas and the apparatus to be used for the purpose, and selected a Chief Gas Examiner, who acted as a court of appeal in cases of dispute arising in connection with the testing of the gas. The Board did not prescribe the quality of the gas to be supplied, nor did they fix the price which was actually charged for gas.

Discussing the statutory conditions affecting the supply of gas, he stated that there were approximately 800 authorized gas undertakings in Great Britain, 500 belonging to companies and 300 to municipal authorities. In addition, there were about 650 unauthorized gas undertakings, most of which were very small. These were not subject to statutory control. He then gave a *résumé* of the statutory conditions as to the price, quality, &c., of gas, and pointed out that there were special provisions as regards the testing of gas in London. For many years there had been a very complete and efficient system of testing by the London County Council and the City Corporation, and the Metropolitan Gas Referees had been appointed by the Board of Trade to prescribe the method of testing.

He then referred to the substitution of the calorific test for the old illuminating power test, the passing of the Gas (Standard of Calorific Power) Act, 1916, and the difficulties which arose in the administration of that Act. Much opposition was shown to its provisions by local authorities and large consumers of gas; and as a result, in all the Orders made under the Act the Board of Trade decided to prescribe a calorific standard of 500 B.Th.U., the standard being subject to revision from time to time. As a result of the discussion which took place upon these Orders, the Board of Trade, in June, 1917, requested the Fuel Research Board to advise them as to "what is the most suitable composition and quality of gas and the minimum pressure at which it should be generally supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of bye-products, and the purposes for which gas is now used." He described the subsequent action taken, which led to an agreement being arrived at between the various interests concerned, which was embodied in a series of resolutions forwarded to the Board of Trade by the Fuel Research Board. It was upon the recommendation of the Research Board, which had thus been found to be generally acceptable, that the technical provisions of the Gas Regulation Act of 1920 were based. He then touched briefly on the recommendations of the Fuel Research Board, and outlined the provisions of the Act.

Replying to questions by the Chairman with regard to the prescribed pressure of gas supplied, Mr. Honey said that the Gas Regulation Act had increased the prescribed minimum pressure to 2 in. He could not say what was the actual pressure of the gas supplied by the London Companies before the Act, but believed he was right in saying that they had always given more than the prescribed minimum

pressure. Asked by the Chairman whether those companies had previously given the 20-10ths which is now essential, Mr. Honey said he had no doubt that they had.

The CHAIRMAN: So that you simply made statutory that which was the practice already?

Mr. HONEY agreed, but pointed out that this raised another question. In London the gas had been very efficiently tested, and the supply had, on the whole, been extremely efficient and satisfactory, both before the war and now; but there were many undertakings in the country to which this observation would not apply. In many cases there was evidence that the pressure at which gas was supplied, in the absence of a sufficient statutory obligation, was not enough to give a satisfactory result to the consumer.

The CHAIRMAN: So that the new minimum pressure may operate to the advantage of the consuming public?

Mr. HONEY replied that it would operate rather more to the advantage of the consumer in the country than in London, especially with regard to the testing of gas. Testing had been well carried out in London for many years; but in the country it had been done perfunctorily in many cases. Under the Act, the system of testing which had been found so satisfactory in London was extended to the whole country. Witness explained to the Committee the provisions of section 9 (4) of the Act, with regard to forfeiture for deficient calorific value, &c.

THE THERM SYSTEM.

Dealing with the therm, Mr. Honey described the method by which the number of therms a consumer received was arrived at, adding that, if the testing of the gas at the official testing place was properly carried out, there could be no doubt that the figure accurately represented the number of therms with which the consumer had been supplied. He also explained that if the calorific value of the gas were lower, the number of therms supplied and charged for in respect of each thousand cubic feet of gas consumed would be less; and that if the calorific value were higher, the number of therms in a thousand cubic feet of gas would be proportionately greater.

As to the manner in which the therm system of charge operated as a safeguard to the consumer, Mr. Honey said that it did, in fact, afford very ample protection in at least two important respects. First, it ensured that no undertakers would willingly supply a gas which contained an avoidable amount of incombustible constituents, because if they did so it would be at their own expense. In this way it met the complaint frequently made that consumers were paying for the useless inerts at the same rate as if they were useful gas. Secondly, it ensured that the gas would be supplied of as constant a quality as it was possible to maintain. The penalties for supplying gas below the declared calorific value were sufficient to prevent substantial variations in a downward direction; and the fact that, if gas were supplied of a higher calorific value than that declared, anything above the declared value could not be charged for, was sufficient inducement to the undertakers to keep the quality as even as they possibly could. This was a point of very great importance to the consumer, because excessive variations in quality, whether up or down, might seriously affect the efficiency of appliances.

Asked by the Chairman to explain the duty of gas companies with regard to apparatus, if they varied their declared calorific value, Mr. Honey said the Act provided that they should adjust the burners of the apparatus used by the consumers so that those burners would consume the gas of the altered value at least as efficiently as the gas of the value previously declared.

The CHAIRMAN pointed out that the Act only provided for adjustment of burners on a change of the calorific value, but did not provide for it in the case of the first declaration. This was a weak spot in the Act.

Mr. HONEY said it might be a weak spot in the Act if, in fact, the burners that were being used were not suitable for the quality of gas supplied, as originally declared. He believed, however, that it was the policy of gas undertakers, whether companies or local authorities, to adjust consumers' burners at more or less regular intervals. He knew it was the case in some places, at any rate; but how far this policy was generally carried out, he was afraid he was not able to say. So far as he had been able to ascertain, it was the general policy in the gas industry to adjust consumers' appliances, so that they might get a satisfactory result from the gas supplied to them.

Reverting to the recommendations of the Fuel Research Board, and how they were dealt with in the Act, Mr. Honey pointed out that one respect in which the Act did not carry out the actual recommendation agreed upon at the conference of the Fuel Research Board and the various bodies interested, was in regard to the suggested limitation of the inert constituents of gas. The Act prescribed no limitation, but required the Board of Trade to appoint a Committee to inquire whether a limitation should be imposed. This Committee had recommended—for the time being, at any rate—that no limitation should be placed upon the proportion of incombustible constituents in town gas.

Proceeding, witness discussed how the thermal basis of charge was brought into operation. He outlined the powers of the Board of Trade to make Orders under the Act on the application of undertakers, and the power to make compulsory Orders if no application was made within two years from the passing of the Act. The two years expired last August; but the Board had not, up to the present, exercised the compulsory powers conferred upon them by the Act. About 370 Orders authorizing the supply of gas on a thermal basis had already been issued, and some 50 applications were still under consideration. Most of the cases so far dealt with had been in respect of companies' undertakings; but 20 local authorities had obtained Orders. At the present time, approximately 90 p.ct. of the whole of the gas supplied by the companies in Great Britain was being supplied under the new system, and about 10 p.ct. of that supplied by local authorities—an aggregate of some 62 p.ct. of the whole of the gas supplied by statutory undertakings.

Answering questions, Mr. Honey said the reason for making the therm system apply only to statutory undertakings was that, unless it was coupled with the efficient testing of gas by the local authority and with the obligation to adjust the consumers' burners when necessary, the therm system might be as fallacious as the system of charging by volume. He told the Chairman that there was nothing to compel the unauthorized companies to come in.

STATUTORY POWERS OF CHARGE.

Next, Mr. Honey dealt with the question of how the new statutory powers of charge were fixed, pointing out that a very detailed and careful examination of the accounts of each undertaking had to be made in order to arrive at the additional amount per therm by which the cost of making and supplying gas had increased since before the war. In effect, a war bonus was added to the old statutory charges, and the amount of the bonus might be varied as occasion required. The accounts of a small company were handed to the Committee, in order that the method of arriving at the standard price for gas could be illustrated. Witness explained that the company could charge what they pleased for gas. But if they charged more than the new standard price, they could not pay their full standard rate of dividend; whereas if they charged less, they could pay more than the standard dividend. The company fixed their own selling price according to the circumstances of the moment.

The CHAIRMAN asked questions with a view to ascertaining where the profits of the company came in.

Mr. HONEY said they were included in the original standard price under the old standard of charging, on which the new price was based. He referred to the case of the Gas Light and Coke Company, as an example of the way in which the new standard price was arrived at. The general effect of the Act, he said, so far as statutory powers of charge (as apart from the method of charge) were concerned, was to entitle gas undertakers to be placed in substantially the same profit-earning capacity as before the war. One of the great advantages of the method which had been adopted for this purpose was that the sliding-scale, which had been entirely thrown out of gear, once more became operative, and no increase in dividend could take place until the consumer had had the benefit of a reduction in price for the whole period in respect of which the increased dividend was payable. The need for re-adjustment of charging powers was not, of course, peculiar to the gas industry, but applied to all public utility undertakings whose charging powers were restricted by pre-war enactments. It had been generally assumed that gas prices had risen in consequence of the new Act. In so far as the re-adjustment of standard prices was concerned, it was true that the companies were put into a position to pay somewhat higher dividends than they were allowed to pay during the war; but these higher dividends had had very little effect in increasing the cost of gas. The statutory standard rates of dividends had not been altered.

As to the position of the industry, Mr. Honey pointed to the very substantial increases in wages which were granted to the gas workers in July, 1920, and the increased cost of coal at that time, remarking that the high prices obtained for residuals had prevented any serious increase in the price of gas as the result of the higher wages and the higher cost of coal and materials. But towards the end of the year, the residual market had broken, with the result that the price of gas had to be increased. Immediately following the slump in residuals, the coal strike intervened—in April, 1921—which added enormously to the expenditure of the companies; and this was reflected in a further increase in the cost of gas. There was little doubt that, but for the coal strike, the introduction of the thermal system of charge would have coincided with a reduction in the price of gas consequent on the general fall in costs; but in any event the introduction of the thermal basis would have had nothing to do with the fall in price, just as it was not responsible for any increase. The process of reducing prices had, however, begun this year; and, in the absence of unforeseen difficulties, it was reasonably certain that it would continue.

Then Mr. Honey emphasized the fact that the new basis of charge was not initiated by the Board of Trade, but was presented to them as an essential part of a policy recommended by a highly-qualified and independent body of experts, and agreed upon and recommended by representatives of municipal authorities, of important bodies of consumers, and of the gas industry. Considering the question of whether this policy was justifying itself in practice, he said that there was considerable diversity in the calorific values which had been declared. The lowest of which he had made a note was 400, and the highest 560 B.Th.U. Mostly they ranged between 450 and 500 B.Th.U. In some cases—*e.g.*, the Gas Light and Coke Company and the South Metropolitan Gas Company—the declared value had been increased. The Gas Light and Coke started with a declared value of 475 B.Th.U., and had now increased it to 500. The South Metropolitan had increased from 550 to 560 B.Th.U. In each case the increase had brought the gas up to approximately the pre-war quality. Calculated by volume, these changes had proportionately increased the price of gas; but as the price per therm had been reduced to a still greater extent, the consumer had not, in fact, paid more for his gas, and had had the advantage of increased efficiency. The fact that the standard of quality could be, and had been, so easily adjusted to the needs of the consumers and the conditions under which the gas undertakings were carried on, was in itself a striking justification of the Act. He was assured that in the case of some undertakings there had already been a marked improvement as regards the constancy of the quality. The earlier records showed much greater variation during the course of the day in the quality of the gas supplied than was the case at present; and he offered to produce evidence on this point, if the Committee desired it. This was a direct and immediate result of the operation of the new Act; and he believed they were justified in anticipating that, as time went on, it would result in a still greater increase in the efficiency of supply. The new system of charge had made it possible to remove from the gas industry the incubus of a standard of quality, which left only a limited scope for the adoption of new technical processes and improvements in methods of manufacture, and which, in practice, took no account of the varying circumstances of the undertakings. The effect of allowing gas undertakers to make full use of all the technical improvements that could be devised must, in the long run, tend to greater efficiency and a reduction in the cost of gas. This policy had not, so far as he was aware, been seriously challenged by any responsible body. The difficulty in carrying it out, but for the system of charging on a thermal basis, would be almost insuperable. This method of charging was, in fact, the key to the whole scheme of

the Act, and, if it were discontinued, an entirely new policy would have to be formulated.

The CHAIRMAN asked witness whether he considered that the increase of calorific value was essential for the benefit of the consumer.

Mr. HONEY replied that it was not necessarily; it depended upon circumstances. He believed the general opinion of those who were in a position to hold an opinion on such a point was that, other things being equal, the better the quality of the gas the better the result to the consumer, because less gas was required for the same amount of heat. Circumstances in the different localities varied. In some districts there were a large number of old houses with comparatively small service-pipes. Though it might be true that a 400 or 450 B.Th.U. gas could be used by the consumers in these houses with as great advantage as a 500 B.Th.U. gas, the defect remained that, in order to get the gas to them, larger service-pipes would have to be put in; so that the "game would not be worth the candle," and it would be an advantage to the undertakers to supply a richer gas which the consumers could get through the smaller pipes.

VERY FEW OBJECTIONS FROM CONSUMERS.

Continuing, Mr. Honey remarked that perhaps he ought to say there had been very few objections made to the Board of Trade directly. He did not think the Board had had a dozen objections direct from consumers. There had been about half-a-dozen cases in which sufficient information had been given to enable the Board to call upon the companies concerned for some explanation. In most instances the explanations seemed to be satisfactory; and they had been sent to the consumers, who had accepted them. There were one or two cases in which the consumer still said that he, or she, could not possibly have used the gas which the meter had recorded; and in one instance at least the consumer had refused to have his meter tested. The consumer was entitled to have his meter tested at the expense of the gas company if it proved to be wrong; but if it were proved to be right, he believed it would cost the consumer about 10s.

Dealing with the objections to the new methods of charge, Mr. Honey said that, so far as he had been able to ascertain, there were three, from the consumer's point of view. The first was that the method of calculation was too complicated to be understood by the consumer.

The CHAIRMAN asked whether there was not something in this.

Mr. HONEY replied that he was not sure that a few lessons in an elementary school would not get over the difficulty. One had a certain amount of sympathy with people who had always been charged on the basis of 1000 c.ft., and, though they did not understand it, did not like to be charged in any other manner.

The CHAIRMAN said that, when they were charged per 1000 c.ft., the consumers could compare consumption with consumption; but when in therms, except for an elaborate calculation, it was difficult for them to arrive at what was being charged for.

Mr. HONEY said they could have compared consumption with consumption in the same way as saying that a man drank a pint of liquor. He might have drunk a pint of whiskey or a pint of beer, which were different things.

The CHAIRMAN said he had noticed that one London Company—he believed it was the Gas Light and Coke Company—made out their bills both in therms and in cubic feet, so that a consumer could compare the amount consumed with that consumed a year ago.

Mr. HONEY replied that he believed this was being done generally. He thought some system of the kind would meet any legitimate objection that there might be on the part of consumers that they could not understand how their accounts were arrived at. Coming to the next objection, he rather hesitated to mention it. It had been put to him by a gentleman who was the Chairman of an Education Committee in a large town. This gentleman had said that the new basis of charging was supposed to be some kind of a dodge for the purpose of increasing prices. The gentleman had said it rather apologetically, because he did not believe it himself. He (Mr. Honey) was perfectly sure it was a feeling that did exist; but he was also equally sure that it was not possible for a gas company to use this system in that way, and that it was certainly not intended as a means of covering-up any increase of price which had to be made owing to the circumstances he had already referred to.

The CHAIRMAN asked whether it was not the fact that the introduction of the therm basis of charge was coincident with an increase in the price of gas.

Mr. HONEY agreed that this was so in some instances. In cases where the introduction of the new system coincided with the coal strike period, naturally, whether the system in vogue had been the therm or any other, gas prices would have had to be increased. He had taken some pains in the inquiries he had held during recent months to ascertain what the intention of gas undertakers was in regard to price; and in practically every case they had said that in no circumstances did they intend to increase the price of gas unless forced to do so by some abnormal increase in cost. On the contrary, they hoped and intended to reduce the price; and this was what had been happening in London itself. It was a fact that under the therm system the price of gas had been enormously reduced; but the therm was not responsible for the reduction, nor was it responsible for the increase that took place in some places at the time of its introduction. The third objection was that, from the point of view of gas undertakings—and especially the smaller ones—it required too high a degree of efficiency on their part to make it a fair method to them; and it was no doubt a fact that, unless an undertaking was very efficiently managed, it must, in order to avoid penalties, supply the consumer with a substantially higher quality of gas than it contracted to do. Therefore it would be, for the time being at any rate, supplying the customer with therms for which it was not able to make a charge.

So far as the difficulty of understanding the method of charge was concerned, said Mr. Honey, he had no doubt that it would disappear as the public became more accustomed to it. The third objection was one of some substance; but it was the deliberate policy of the Gas Regulation Act to increase the efficiency of the supply of gas, and the gas industry must find means—by amalgamations or a joint control, or by some other method of pooling resources—to increase the efficiency of those undertakings which, standing alone, could not afford the technical advice and supervision which was available in the case of the larger concerns.

NEWSPAPER AGITATION AND ALLEGED INCREASED CONSUMPTION.

As to the recent newspaper agitation, this seemed to have been due to complaints by gas consumers that their accounts for the quarter ended June 30 last were much in excess of those for the corresponding quarter of the previous year. He understood the general answer of the gas industry to be that the total amount of gas sold this year showed only a moderate increase over the corresponding period of 1921, and did not indicate any increase in consumption which could not be accounted for by (*a*) the temperature during March to June of this year being lower than in the corresponding months of last year, (*b*) the fact that during the coal strike in April, May, and June, 1921, consumers were urged to use as little gas as possible, and (*c*) by the additional consumption resulting from additional consumers and additional appliances.

The final point dealt with was the question of whether there has been a general increase in the consumption of gas. Mr. Honey said that it had been impossible for the Board of Trade to investigate complaints by individual consumers. Clearly, if their meters had recorded an abnormal consumption, the question became one of the accuracy of the meter, and any consumer of gas in London could get his meter officially tested by the London County Council. The Board of Trade had, however, taken some steps to form a conclusion as to whether there had been a general increase in the consumption this year. Taking the case of the Gas Light and Coke Company as an illustration, it was found that the total amount of gas sold by that Company during the half year ended in June last was 7 p.ct. more than in the corresponding period of 1921. This did not appear to be an abnormal increase, having regard to the conditions existing in 1921 and in this year. The average consumption of the ordinary consumer during the half year increased by 7·7 p.ct.—that was to say, from 29,100 c.ft. to 31,340 c.ft. At the same time, the average consumption by prepayment consumers fell by 2·42 p.ct. The average receipts from ordinary consumers increased from £7 11s. 5d. for the half year to £7 15s. 1d. —that was to say, by 2·42 p.ct.—though the consumption had increased by 7·7 p.ct. The average receipts from prepayment consumers fell from £2 13s. 2d. to £2 11s. 8d., a decrease of 2·82 p.ct.—though the consumption had only decreased by 2·42 p.ct. As, during each of these half years, the calorific value of gas declared and supplied by the Company was unchanged, and as the average receipts per ordinary consumer had increased in smaller proportion than the consumption had increased, the actual figures seemed to form a fairly complete answer to the allegation that the result of charging per therm was to make a general increase in consumers' accounts.

The CHAIRMAN, when the Committee adjourned for luncheon, informed Mr. Hope, who had protested at the opening, that he would not be allowed to put questions to witnesses himself.

THE PROCEDURE.

The CHAIRMAN, after the luncheon interval, made a statement as to the manner in which the inquiry was to be conducted. The Committee proposed, he said, to invite the three big London Gas Companies to give evidence, and also some of the larger gas companies in the Provinces, if found to be necessary. Evidence from railway companies, as large consumers, would be welcomed. From the point of view of the private consumers, the Committee were very anxious that they should be represented, not by individual people with individual grumbles, but by associations, such as ratepayers' associations, the borough councils, or any really representative body capable of voicing the grievances of any private consumers. No single member of the public would be allowed to ask witnesses any questions.

Replying to Mr. Woolcock with regard to the fixing of the new standard price, Mr. HONEY made it clear that the Board of Trade were not entitled to go into the question of whether the basic price (the standard price charged under the old system) was too high or too low, but simply had to translate that into its exact equivalent per therm, and add what he called the war bonus, so that, if conditions became normal again, the standard price could be brought back to the pre-war level. Dealing again with the sliding-scale, he said that the gas industry, so far as he knew, was the only industry in which, when prices were increased, dividends must be reduced. Answering a further question as to whether the fact of the elimination of inerts was taken into account when adding the war bonus, Mr. Honey said the therm system eliminated all questions of inerts and volume, and so on. When they said that 1000 c.ft. of gas cost so much before the war and so much now, they were comparing two things which were not alike; but under the therm system, they were able to compare like with like. As to the action of the Board of Trade with regard to the adjustment of burners, if there had been any complaint, the Board would have looked into it; but there had been no complaint. He knew that the gas industry had a very efficient organization which made it its business to educate the consumers in the efficient use of appliances; but he could not say the exact scope of its work. Asked whether, supposing the gas-meters really showed in therms the quantity of gas being burned and the number of therms that had to be charged for, this would allay any possible irritation as a result of the change-over, Mr. Honey said that was what was done in the electricity industry at the moment. A consumer knew he had consumed so many electrical units; but he supposed that very few of the public knew what an electrical unit was. He should be sorry to explain it. [Laughter.]

Mr. WOOLCOCK: You do not hesitate to explain the therm; but you would hesitate at the electrical unit, which the public swallows without any trouble whatever?

Mr. HONEY replied that the Fuel Research Board had said that the thermal system of charging was much more simple and easily understood than the system of charging for electricity. He agreed that, if it were possible to show on the meter exactly the number of therms consumed, so that the meter would correspond with the bill, it ought to meet the public view. He pointed out, however, that he did not think it practicable at the moment to show only the number of therms con-

sumed. The meter must continue to register the volume of gas. It seemed to him that the only practicable method—and he believed it was practicable—was that there should be some attachment to the ordinary meter which would indicate the number of therms supplied. The meter would show on the index the number of cubic feet consumed; but, by means of change wheels, there could also be an attachment registering the number of therms, so that the meter would make the calculation. What was wanted was something which would automatically make the calculation for the consumer.

PROTECTION OF THE CONSUMERS.

Mr. Pugh put a series of questions as to whether the number of gas examiners appointed was sufficient to protect the interests of the consumers, and whether the testing of the gas was adequately attended to. Mr. Honey believed it was not so in the country at the moment. In London itself, however, it was; and he believed that in the home counties generally the testing arrangements were fairly efficient, although he was speaking from hearsay. As to whether the consumer was sufficiently protected by the operation of the sliding-scale, Mr. Honey said that he believed within reasonable time there must be a revision of the war bonus. Under the sliding-scale, if a company were paying a higher dividend than before the war, the consumer was getting six times as much, in the way of a reduction in price, as the stockholder was taking in his dividend; so that the consumer was pretty well protected. He should think that the price of gas had been reduced consistently with the reduced cost of materials since 1920. Taking the cost of materials used for making gas—the coal and oil and so on—by the three large Metropolitan Companies grouped together, this was: In 1913, 15·67d. per 1000 c.ft.; in 1917, over 29d.; in 1918, over 34d.; in 1919, 37d.; in 1920, 43d.; and in 1921, 41d. He should imagine that the cost would be down somewhere near the 1919 figure by this time. The amount received for residuals was deducted from the cost of the coal. The prices received for residuals per 1000 c.ft. were: In 1913, 11d.; in 1917, 17d.; in 1918, 18d.; in 1919, 22d.; in 1920, 35d.; and in 1921, 21d. So that the net cost of materials for making the gas was in 1913 4½d., and in 1921 20⅛d., per 1000 c.ft. The Gas Light and Coke Company, since they had increased their price in March, 1921, had now reduced it to 10d. per therm (the standard price being 15·2d. per therm). There was every inducement to gas undertakings to reduce prices; and he believed the Act was a measure definitely required in the interests of the community.

Mr. PUGH said there was an impression that it was something in the nature of a war measure which is being retained after the war.

Mr. HONEY replied that there was no foundation for it.

Answering a question by Mr. Pugh as to whether there was anything to ensure that appliances were adjusted, or whether it was left to the discretion of gas producers, Mr. Honey said that in London it had been found by experience that there was no more vigilant custodian of the interests of the consumer than the London County Council. They were closely in touch with the gas undertakings; they tested the gas at a large number of stations every day; they had an official station for testing consumers' meters; and they had a department, he believed, part of whose duty it was to consider the gas question. In practice it was found that if the gas companies were not doing their statutory duty, they were quickly pulled-up by the Council.

Mr. PUGH said he supposed this depended on the consumer's making a complaint. There were a large number of small consumers in London. The large consumer could look after himself, but the small consumer could not; and he was anxious to know what means existed for the protection of the small consumer in the matter of adjustment of apparatus.

Mr. HONEY replied that the large majority of small consumers were supplied by slot meter, which in itself was a sort of guarantee that what Mr. Pugh was suggesting should be done would be done. A company was, naturally, very much more closely in touch with the prepayment consumer than with the larger consumer. From the Departmental point of view, he could only say that no complaints had reached him.

Replying to Mr. BALFOUR, Mr. Honey said there was no demand from the public as a whole for the change-over to the therm system of charging; but the thermal system gave the most certain value for money, both in regard to lighting and heating. He agreed with Mr. Balfour that it was wholly a question of educating the public. There were no complaints actually from the public.

Mr. BALFOUR: Then who does complain about the therm system? [Laughter.]

Mr. HONEY replied that the request for the inquiry came mainly from the London County Council.

Replying to Mr. BALFOUR, who said he had been struck with the richness of the London gas, with the exception of that of the Commercial Company, as compared with the rest of the country, Mr. Honey said that in London the quality was pretty good.

Mr. BALFOUR said that, if gas companies showed clearly on their accounts the date of the last reading of the meter and of the previous reading, the number of cubic feet translated into therms, and the price per therm, and below that a calculation showing the amount per 1000 c.ft., would not that get over the difficulty?

Mr. HONEY said he believed it would, pointing out that it was already done by many companies.

Mr. BALFOUR: If this were done consistently throughout the country, any little friction that now exists would be done away with?

Mr. HONEY said something on those lines should be done.

Replying to Mr. Balfour, as to the suggested meter attachment—that this could only work if the calorific value of the gas always remained constant—Mr. Honey explained that his object in saying that it should be an attachment, and not an integral part of the meter, was because it might be necessary, from time to time, to alter the calorific value. For instance, if it were found that a 600 B.Th.U. gas was the most suitable for the consumers, and the company concerned had been supplying at 500 B.Th.U., they could, with no trouble beyond the adjustment of consumers' burners, alter the calorific value; and that was the advantage of the Act. But if, at the same time, they had to take out all the meters, have the wheels altered, and send the meters to be tested, it was impossible.

Asked if there were any new item in the gas companies' accounts for 1920 and 1921 which did not appear in pre-war accounts, Mr. Honey said he should say not—they were still on the same form.

Sir JAMES MARTIN then referred to the reading of the meter, saying that it was easy to one saturated in the industry; but was it easy to the average householder?

Mr. HONEY said he was an average householder.

Mr. BALFOUR: Among other things.

Sir JAMES MARTIN said Mr. Honey was also an expert. His point was that there was a great deal of public dissatisfaction, in spite of the absence of complaints addressed to the Board of Trade; and he submitted that it had arisen in two ways. First, that the public had not been able to take full advantage of the alteration of the system, and, secondly, they did not properly understand the basis of the charges made.

Mr. HONEY agreed with regard to the second reason, and said that this was one reason why he thought an inquiry of this kind was valuable. It was important that the public should understand it, and feel a certain amount of confidence in its fairness.

Sir JAMES MARTIN said his point was that it was essential that the method of charge should be brought home to the understanding of the public—to every member of the public who had an understanding mind, of course.

QUESTIONS INVITED.

At the conclusion of Mr. Honey's evidence, representatives of the London County Council, the National Gas Council, the Gas Companies' Protection Association, or any other body, were invited to put questions to the witness. The only question raised, however, was by Mr. Campbell Cooper (Gas Companies' Protection Association), as to whether or not Mr. Honey agreed that there was a great amount of dissatisfaction. Mr. Honey replied that it was a matter of opinion, reiterating that the main evidence of dissatisfaction came from the London County Council.

PROF. C. V. BOYS GIVES EVIDENCE.

Prof. C. V. BOYS, F.R.S, then gave evidence on behalf of the Gas Referees, and handed the following statement to the Committee:

1.—The Gas Referees (then the Metropolitan Gas Referees) participated in conferences at the Board of Trade which were held with reference to the recommendations of the Fuel Research Board as a precedent to the introduction of the Bill, which ultimately was passed as the Gas Regulation Act, 1920. They supported the recommendation that the charges for gas should be on a thermal basis, because they were satisfied that, over a wide range of variation of calorific values (say, from 250 to 600 B.Th.U per c.ft.), the service which gas will render to the consumer is broadly directly proportional to the number of heat units supplied to him, and has no relation to the volume of gas, irrespective of its calorific value, which is consumed by him. Experiences or experiments cited to the contrary rest on fallacies which can be readily exposed.

2.—The gas consumer buys gas for the sake of the heat that it produces; and he is not seriously interested in any other attribute of the gas—in other words, the gas undertaking is a heat merchant. Bearing this in mind, it appears to the Gas Referees that the consumer would pay fairly for the gas he uses according to either of two procedures—viz.:

(1) The gas to be of substantially the same calorific value in all places, in which case the charge could be made indifferently on the cubic foot or the thermal basis. This procedure has been condemned, by the Fuel Research Board and by practically everyone who has studied the question of gas supply in different parts of the country, as uneconomical and cutting at the root of all progress in gas manufacture

(2) The gas to be of whatever calorific value is that which will supply the consumer with heat most economically in the circumstances of the particular locality, in which case the charge can, in fairness to the consumer, be based only upon the heat supplied—that is, on a thermal basis. There are two possible methods of making the charge on this basis—viz.:

(*a*) Charging at so much a 1000 c.ft., the "so much" depending on the heating value of each 1000 c.ft.

(*b*) Charging directly for the heat which the consumer has received—viz., charging by some unit of heat, such as the therm.

3.—The first (*a*) method of charging, at so much per 1000 c.ft., is simple and direct for a particular undertaking; but it has the disadvantage that the consumer has no direct indication of the price he is paying for the commodity he uses—viz., heat. As a consequence, comparison of the cost of value received is not directly evident. For instance, if in one locality the declared calorific value of the gas is 400 B.Th.U. per c.ft. and the price 4s. per 1000 c.ft., whereas in another locality the declared calorific value is 550 and the price is 5s. per 1000 c.ft., it is not directly evident that the consumers in the latter locality are getting better value. The corresponding price would be 5s. 6d.

4.—The second (*b*) method of charging is based directly upon the value of the commodity to the consumer. The only disadvantage of this method is that it is not directly in terms of the cubic feet measured by the meter. This disadvantage is not serious, and may be overcome to a great extent by affixing to each meter, close to the index, a label with the words "1000 c.ft. = 5 therms" (or whatever the number may be). In addition, each consumer's gas account and meter card should have on it in prominent type the words "1000 c.ft. of the gas supplied by this undertaking is equal to 5 therms" (or other number).

5.—An objection has been urged that a consumer does not utilize all the heat that is produced by the gas on combustion, and therefore he should not pay for it all. It may be mentioned that in the domestic fire probably not more than one quarter of the heat produced by burning the coal is utilized in the room, while the greater part goes up the chimney. Coal merchants have not been asked on this account to charge for only a quarter of the coal supplied. The consumer may obtain much more heat from the coal by burning it in a stove; but he prefers the more extravagant use. In the same way, where gas is used for boiling a kettle, for cooking, or for a gas-fire, the consumer prefers

a simple and convenient method of burning the gas, involving some waste of heat, to the use of elaborate appliances from which all, or a much greater proportion of, the heat produced can be utilized. As the proportion of heat utilized in any class of operation is substantially the same, it is immaterial whether the gas has a higher or a lower calorific value. Payment by the consumer for the heat received therefore means that for any class of operation he pays the same for the heat he utilizes. This is not true, if gas is charged by the 1000 c.ft., unless the price is also adapted to its calorific value, which is a more complicated operation.

6.—Concurrently with the introduction of the therm system of charging, authority has been given to gas undertakings to charge a higher price than hitherto for the same gas. This necessarily higher price is based on economic factors, which have nothing to do with the therm; and it is not surprising, therefore, that many consumers who were ignorant of this fact have attributed the increased gas bills to the therm system of charging.

7.—If gas is charged for on the old system—that is, by the 1000 c ft.—it is necessary to specify and prove its calorific value, which, after all, is its definite money value to the consumer. If this is not done, the consumer has no guarantee that he is getting his due in combustible gas. An inefficient gas undertaking may allow furnace gas or air to mix with the combustible gas and be registered by the consumer's meter, as was unavoidable in many towns during the war.

8.—The testing provisions of the Gas Regulation Act, 1920, afford a guarantee that the consumer receives gas of the value for which he pays. It is possible that the Committee may desire to know what has been done up to the present in carrying out these provisions.

9.—Prescriptions have been issued by the Gas Referees for the systematic testing of 70 p.ct. of the gas supplied by companies in Great Britain. The number of premises (consumer's meters) protected by these prescriptions is 2,932,632. Prescriptions will follow in due course for the companies which supply the remaining 30 p.ct.; and in view of this, the local authorities in many of these cases have already appointed gas examiners.

10.—Comparatively few local authorities who supply gas have applied for Orders under the Gas Regulation Act, 1920; and consequently very few prescriptions have yet been issued by the Gas Referees for testing the gas supplied by these undertakings.

11.—The number of official testing-places provided by gas undertakings in accordance with the prescriptions of the Gas Referees is now 211, and the number of testings made in the quarter ended Sept. 30, 1922, by examiners appointed by local authorities was 5616

12.—The number of local authority areas (boroughs, urban districts, and counties—for rural districts) for which gas examiners have been appointed is now 377, which indicates that the local authorities, as a whole, realize to the full the importance of ascertaining that the consumer receives the heat units or therms to which he is entitled, and that in other respects the gas undertaking is fulfilling its obligations to the public.

13.—Several County Councils have greatly facilitated the working of the testing provisions by arranging with the local authorities in the county for joint appointments of Gas Examiners. For instance, in the neighbourhood of London, the County Councils of Middlesex, Hertfordshire, Surrey, and Kent have joined in such arrangements. The gas examiners throughout Middlesex have been appointed by the County Council with the consent of all the local authorities in the county (except one which has appointed independently); and an exceedingly efficient, and at the same time economical, organization has thus been set up. This organization is largely on the lines of that previously set up under the Metropolitan Gas Acts by the London County Council and the City Corporation, which has worked admirably for many years. The Gas Referees have abundant evidence that the majority of local authorities throughout the country regard the appointmen of gas examiners for the protection of consumers as an important civic duty.

14.—The testings of calorific value have been made generally with non-recording calorimeters; but in the case of all the larger undertakings these will be superseded—in accordance with the requirements of section 5 (2) of the Gas Regulation Act—by instruments for the purpose of producing a continuous record of the calorific value of the gas. Several types of these instruments have been submitted to trial in testing-place conditions; but none of them so far fully meets the requirements. One—the Fairweather—which was developed in the laboratory of the Brentford Gas Company, is being used provisionally in two official testing-places for this Company's gas, with some success; but it is not wholly satisfactory. It has to be borne in mind that the record of a continuous calorimeter must throughout be capable of proof in a Court of Law, and that very large sums of money may be transferred from or to the consumers' pockets by virtue of the results recorded.

15.—Speaking for myself I felt, when the Gas Regulation Bill was being discussed in the conferences at the Board of Trade, that a recording calorimeter that would fully meet all requirements had not yet been made, and that the problem of providing one, while difficult, was one which I might investigate. As all my scientific work has lain in the direction of determinations of minute accuracy and the provision of the necessary new devices, I felt that the problem was one in which I might expect to make substantial progress. After three years, I believe I have produced an instrument which meets every requirement, an account of which is printed in the "Proceedings" of the Institution of Gas Engineers for 1922.* This instrument I showed to the members at their summer meeting, and copies of the paper I am now providing for use by the Committee. I have been for some months in close touch with an instrument maker, with a view to making certain modifications in detail to adapt the instrument for manufacture; for the instrument which I have made myself has been developed and has been constructed with a view to establishing the utility of the invention rather than as a mode of construction to be followed in exact detail. Two instruments have been made and are undergoing preliminary tests by the maker. Then, when I have made further tests, the Gas Referees hope to place one of these instruments in the charge of a gas examiner in an official testing-place for trial. If any other type of instrument is available, it will be tried at the same time. Should this prove satisfactory, the Gas Referees should be able, in the course of next year, to get the introduction of recording calorimeters into the testing-places well started.

16.—Pending the certification of a recording calorimeter, the gas supplied by the larger as well as the smaller undertakings is tested at frequent intervals by means of a non-recording calorimeter. For instance, in the district of the Gas Light and Coke Company alone, no fewer than 2047 such testings were made last quarter under the Referees' prescription, by gas examiners appointed by the London County Council and by neighbouring local authorities. The testing arrangements thus established in all places for which the Gas Referees have issued prescriptions, and for which gas examiners have been appointed, afford a guarantee to the public that if the gas undertaking fails to fulfil its statutory obligations in respect of calorific value, &c., the failure will almost infallibly be detected and redressed as provided for in sections 8 and 9 of the Gas Regulation Act, 1920.

The consumer is afforded facilities for ascertaining if the gas undertaking has fulfilled its obligations. The Gas Referees prescribe that a quarterly report of the testings made by the official gas examiner shall, in addition to being forwarded to the local authorities, be exhibited in each of the showrooms and rental offices of the undertaking, and be produced to any consumer on demand. A notice to this effect is printed on each consumer's gas account. The results of the testings are thus made readily accessible to the public.

17.—The trustworthiness of the testings and of the results reported by the gas examiners depends primarily on the accuracy of the apparatus used in the testings. The essential parts of the apparatus are examined by the Gas Referees before it is used for official purposes under their prescription; and in the course of this work they have found that a very large proportion of the testing apparatus previously in use outside Central London (for which area the Metropolitan Gas Referees had examined apparatus), as well as much of the apparatus now being sold, is so inaccurate that results obtained with it would be almost entirely vitiated. The following is a statement of the number of certain parts of the calorimetric apparatus which have been examined by the Referees' staff up to date, and the number which have been rejected as unfit for use in gas testing (even though a table of corrections is applied in the case of the long thermometers, to avoid an excessive number of rejections):

—	Examined.	Rejected.
Long thermometers graduated in tenths of a degree	1334	132
Short thermometers graduated in degrees	1547	211
Water measuring vessels	501	37
Meter proving measures	371	6

The Referees issue certificates of accuracy for all apparatus which is examined by them; and the gas examiners are required to see that only apparatus which has been thus certified is used in official testings. The results of testings are in consequence free from question on the ground of possible inaccuracy in the testing apparatus. This certification of apparatus is regarded by the Referees as one of the most important of their duties, because the results of the testings of calorific value determine, under section 9 (4) of the Gas Regulation Act, 1920, the possible transference of large sums from or to the pockets of gas consumers.

Two tables, referring to testings, were also handed to the Committee (see over-leaf).

In the course of questioning, Prof. Boys handed to the Committee a form of account to be rendered by the Bristol Gas Company to its consumers, for the December quarter, 1922, which set out clearly the gas used, both in volume and in therms, and gave other information which enabled the consumer to make comparisons. There were also instructions on the back as to what a therm was, how the conversion was calculated, and how to read a gas-meter.

The CHAIRMAN said it seemed to be a very comprehensive and satisfactory document; but it was only a voluntary form.

Prof. BOYS said that the particular arrangement adopted was the Bristol Company's own.

Answering further questions, Prof. BOYS said he did not think there was a single case of a company making a declaration for the first time of the value that it was going to give which was at all different, or, at any rate, more than microscopically different, from that which they had been producing.

Questions were then put by the Chairman as to whether three consumers, each with the same service pipe and apparatus, but burning gas of 475, 500, and 560 B.Th.U. respectively, as in the case of consumers of the three London Companies, would want different lengths of time to boil a quart of water. Witness agreed that the weaker gas would take longer; but, providing the flame was used properly, and was not flaring-out all round the kettle, the number of therms used, for all practical purposes, would be the same. He could not speak with regard to incandescent mantles, because he had not made tests; but, generally speaking, the richer the gas, the less would have to be burned for the same light. Reverting to the example of the kettle on the gas ring, he said that few consumers knew how to use the ring. If the flame just licked the edges of the kettle it was all right; but if the flame were flaring out all round, there would be a certain amount of waste. Asked whether increased pressure led to increased waste by the private consumer, Prof. Boys advocated the use by consumers of a governor in each house, so that, whatever the pressure in the mains, consumers would be always working at the same pressure; but very few consumers had them. The pressure in the mains must vary. He had tested pressure in Victoria Street, London. The pressure maintained for most of the day was about 4½ in.; but about 10 or 11 o'clock at night it dropped to about 3½ in., rising again at about 6 o'clock in the morning. That was the area of the Gas Light and Coke Company.

Witness was not able to say what the companies were doing with

* See "JOURNAL," Vol. CLVIII., p. 882.

PUBLICATION OF RESULTS OF TESTS.

Note on Seven Specimen Reports (as issued to the public) for the Quarter Ended Sept 30, 1922, as handed in by Prof. C V. Boys on behalf of the Gas Referees.

Undertaking.	Number of Consumers' Premises Supplied (in 1920).	Cubic Feet of Gas Supplied (in 1920).	Number of Testing Places.	Number of Official Tests of Calorific Value made in the Quarter.	Calorific Value.		Therms per Annum (applying this Quarter's Calorific Value to Quantity of Gas sold in 1920).	
					Average for the Quarter Ascertained from the Tests.	"Declared" by the Undertaking.	Due According to the Calorific Value "Declared."	Given According to the Average Calorific Value Ascertained.
Gas Light and Coke Company . .	843,128	31,963,543,000	14	2047	501·6	500	159,817,715	160,329,132
South Metropolitan Gas Company	389,173	14,343,415,000	6	1098	565·0	560	80,323,124	81,040,295
Sheffield Gas Company	106,828	4,978,434,000	3	581	536·2	500	24,892,170	26,694,363
Brentford Gas Company. . .	124,093	4,501,303,000	3	*	471·2	460	20,705,994	21,210,140
Commercial Gas Company . . .	116,049	3,919,402,000	3	552	492·0	475	18,617,159	19,283,458
Wandsworth, Wimbledon, and Epsom Gas Company	75,264	3,025,064,000	3	212	479·7	470	14,217,801	14,511,232
South Suburban Gas Company .	82,141	2,942,003,000	4	197	477·7	460	13,533,214	14,053,948

* The average for the Brentford Gas Company has been ascertained from continuous records, verified twice a week at two testing places, supplemented by 34 tests with non-recording calorimeters on independent streams of gas.

GAS REGULATION ACT, 1920.

Summary of Testing Provisions in Force, and Tests Made by Officially Appointed Gas Examiners.

Gas Referees' Office, Dec. 11, 1922.

—	Owned by Companies.	Owned by Local Authorities.	Total.
Number of authorized gas undertakings in Great Britain (1919)	497	296	793
Quantity of gas sold by these undertakings. Millions of cubic feet	143,695	79,188	222,883
Number of premises (separate meters) supplied by these undertakings	4,428,833	2,921,615	7,350,448

—	Quarter Ended Sept. 30, 1922.			Quarter Ending Dec. 31, 1922.			Quarter Ending March 31, 1923. (Estimated.)		
	Companies.	Local Authorities.	Total.	Companies.	Local Authorities.	Total.	Companies.	Local Authorities.	Total.
Number of gas undertakings with Gas Referees' Prescriptions in force for whole quarter	86	..	86	135	1	136	172	5	177
Quantity of gas sold by these undertakings. Millions of cubic feet	88,938	..	88,938	101,793	449	102,242	108,907	3,137	112,044
Quantity of gas sold by these undertakings. Percentage of gas sold by all undertakings	61·9	..	39·9	70·8	0·6	45 9	75·8	4·0	50 3
Number of premises supplied by these undertakings	2,512,976	..	2,512,976	2,932,632	20,462	2,953,092	3,170,437	94,002	3,264,439
Number of premises supplied by these undertakings. Percentage of all premises supplied with gas	56·8	..	34·2	64·0	0·7	40 2	71·6	3 2	44·4
Number of local authority (borough, urban district, or county) areas covered by the Prescriptions	289	..	289	376	2	378	451	8	459
Number of official testing places prescribed and provided	139	..	139	174	1	175	211	5	216
Number of local authority areas for which Gas Examiners have been appointed up to Dec. 11, 1922	..	..	..	..	..	..	369	8	377
Number of gas undertakings covered wholly or partially by these appointments	75	..	75	124	1	125	199	4	203
Number of official tests (each of calorific value, purity, and pressure) actually made	5,616	..	5,616	..	..	..	..	..	..

regard to fittings. In connection with fittings, he remarked that the ironmonger was gloriously innocent about pressures, heat values, &c.

Replying to Mr. BALFOUR, who suggested that, if all accounts were rendered in the same manner as those of the Bristol Company, together with the instructions on the back of the form, there would have been no trouble at all, witness said he did not think there would.

Sir JAMES MARTIN asked whether steps were taken, when the alteration of system took place, to see whether the burners were adaptable to the new system.

Prof. BOYS replied that he did not think there had been an alteration of the system in the sense of an alteration of calorific value. His recollection was that the question of the consumers' burners had been looked into very carefully. There had been no great change of calorific value in London.

The question of the use of fishtail burners was also mentioned, and Prof. Boys said that, in the South Metropolitan Company's area, where a 560 B.Th.U. gas was supplied, they were eminently adapted for burning it. In the poor neighbourhood served by this Company, a very large number of consumers were believed by the Company to be incapable of managing a mantle. These consumers preferred the fishtail burner; and the gas had been adapted to it. For this reason the Company kept up the high value of gas for the poor consumers. Where gas had been brought down to lower values, the light given by fishtail burners fell-off; and he agreed that for lighting it was better to substitute another burner. The fishtail burner did not give a very bad light with a 500 B.Th.U. gas; but it was not comparable with that given by an incandescent mantle. He alluded to the convenience of fishtail burners in doorways and other places where mantles would get blown and knocked about.

Sir JAMES MARTIN said he was not putting the case of whether there was a great deal of dissatisfaction; but he asked whether that which existed was not brought about through the consumer's using old-fashioned appliances and not getting the light he wanted.

Prof. BOYS said he had not heard of that; but he had seen by published articles that there was a certain amount of dissatisfaction.

In reply to Mr. Pugh, who asked whether witness was satisfied with the adequacy of the examiners appointed, Prof. Boys said the Referees had not had complaints, nor had they wished to make representations. That applied to the Provinces as well as London. As to whether the presence of inerts affected the consumer, Prof. Boys said that if a consumer wanted high temperatures, for metallurgical operations, &c., he (witness) would strongly disapprove of an inert gas being used; but in the household he did not think it really mattered, because if the value was less the consumer paid less.

Mr. WOOLCOCK referred to witness's remarks as to waste up the chimney, and suggested that the comparison between the gas undertaker and the coal merchant was rather picturesque.

Prof. BOYS said it was a comparison made to meet a particular objection, which was, he thought, an absurd objection—that because some was wasted the consumer should not pay for all.

Finally, the Chairman asked Prof. Boys if he were satisfied that under this new system the public got what they paid for, and that it was a better system than before.

Prof. BOYS said he was quite satisfied of both those propositions.

The Committee then adjourned until Monday, Dec. 18.

Monday, Dec. 18.

Dr. C. H. LANDER (Deputy-Director of Fuel Research, Fuel Research Board) gave evidence this morning. He set out the terms of reference of the Fuel Research Board, pointing out that the Board were independent of the gas or any other industry, and that neither the

Board nor the Department of Scientific and Industrial Research was concerned with the administration of any Statute. Therefore, they were able to take an unbiassed scientific view of the question under discussion from the national standpoint. He pointed out that there were obvious advantages in charging per therm as compared with the luminous power basis. In practice, it was not possible to use all the heat that the gas was capable of producing. The percentage of heat which was usefully employed depended upon the efficiency of the appliances by which it was used. The appliances in common use were such that, with suitable adjustment, their efficiency would vary little with changes between fairly wide limits in the calorific value of the gas. Provided, therefore, that appliances were suitably adjusted, the calorific value of the gas was of little importance. It was the price per therm and not the price per cubic foot that really mattered to the consumer. Dealing with the cost of production of gas, witness pointed out that, according to local conditions, this might in many cases be less for a gas of low calorific value than for one of high calorific value. In addition to cost of production, there was the cost of distribution. The cost of distributing a therm of gas of a low calorific value was generally greater than that of distributing a therm of gas of a higher calorific value, owing to the greater bulk, as well as the necessity for larger gasholders and meters. The calorific value which would result in the lowest cost per therm of gas delivered depended on a number of factors, which he enumerated, such as cost of coal, retorting, capital charges, &c.; and the characteristics of each undertaking had to be determined before the best calorific value could be determined in any given case. Owing to the fact that circumstances might change from time to time, there was no permanently "best" value for any given undertaking.

The CHAIRMAN asked whether witness would attach no importance to uniformity of supply throughout (say) London.

Dr. LANDER said he would not go so far as to localize in that way; but, for the whole country, certainly not. Answering a further question, he did not consider a consumer of a lower thermal value gas to be at a disadvantage as compared with a consumer of a higher thermal value gas, provided that his appliances were properly adjusted. Continuing, he said that it was not in the interests of the consumer that one definite quality of gas should be prescribed, irrespective of varying conditions, and the Fuel Research Board had recommended, after extensive inquiries and experiment, that each undertaking should be allowed to select the calorific value best suited to its circumstances. He also referred to the Board's recommendation that a continuous record should be kept of the calorific value of the gas supplied—the keeping of such a record was an essential part of the recommendations of the Board—to the recommendations, for safeguarding consumers, to ensure freedom from sulphur, and to ensure that alterations in calorific value should be notified and consumers' appliances be adjusted or replaced if necessary.

In reply to the Chairman, who said there was not a calorimeter in existence at the present moment which would measure continuously the quality of the gas, Dr. Lander said he did not think the Board would agree with that view. He believed the Board were of opinion that there was a calorimeter which was reasonably good, and which might have been used during the period in which a better type of instrument was being evolved. He believed the difficulty was being got over, however, inasmuch as, from Dr. Boys' evidence, there is a calorimeter in view which was considered to be much better. Of course, the Board, having no administrative functions, could not lay down any requirements as to calorimeters. It was for the Gas Referees.

The CHAIRMAN asked Dr. Lander whether he had thought of the necessity of installing governors in houses.

Dr. LANDER replied that, while governors were desirable, they were a refinement in the bulk of private consumers' cases.

Replying to a further question, Dr. Lander said that the price per 1000 c.ft. would be no criterion of the real value of the gas to the consumer. Comparisons between the prices charged per therm by different companies were true comparisons; whereas comparisons per 1000 c.ft. meant nothing unless the calorific value was settled and the price reduced to the thermal basis.

With regard to incombustible constituents in gases, these were to a certain extent inseparable from the type of process adopted. It might be said that no gas could be produced without inert constituents. If it were to be supplied without such constituents, elaborate and expensive methods must be adopted for their removal. Under the old mode of charging, it might conceivably have paid the gas undertakings deliberately to pump an undue proportion of inert gases through the mains, because they were charged for at the same price as the combustible gas; but under the new method it could not be in the interests of the undertakings to increase the quantity of inerts, because they could not obtain a price for them. It was unfortunate that certain gas undertakings had increased the price of their gas at the time the change was introduced, and it was perhaps more unfortunate that it was not clearly stated at that time that the actual price of the gas was being increased. If a consumer's gas bill had increased at the time of the introduction of the therm system, it must have been due to either increase in the selling price of gas or an increase of consumption registered by the meter in cubic feet. In the latter case, it might have been due either to increased consumption or to an incorrect meter. An increase in the bill could not be due to the change in the method of charging. The abandonment of the therm at the present stage would leave the consumer without any means of determining whether the price he was paying was a fair one, and also without any means of determining whether the price he paid after a change in the calorific value of the gas supplied by his particular undertaking was at all commensurate with that paid before such change. The therm basis was the only means of charging the consumer for what he actually received.

The CHAIRMAN said he had noticed that Sir George Beilby had laid it down that gas should be of a sufficient calorific power. He took it that the Board had taken no lead in saying what was a sufficient calorific power.

Dr. LANDER said he thought the Board would be satisfied with a calorific value anywhere between 350 and 600 B.Th.U., provided the appliances were properly adjusted.

The CHAIRMAN said that Sir George Beilby had also laid down that the gas should be of suitable chemical composition; but, except for the exclusion of carburetted hydrogen, there was nothing in the report of the Board defining a suitable chemical composition. It was also laid down that there should be a certain minimum pressure.

Dr. LANDER said that there was, of course, a limitation of inerts in the report. With regard to pressure, the more constant the better; but it was obvious that an absolutely uniform pressure at every consumer's service pipe could not be maintained, owing to variations in demand.

The CHAIRMAN, dealing with appliances and their adjustment, asked Dr. Lander whether he thought it possible to adjust all the various appliances used throughout London in order to make them efficient for the varying pressures.

Dr. LANDER called attention to the fact that the Board, in their report, had said "adjust or replace." That was also the expression used in the Act.

With regard to the effect of varying calorific values on the light given by gas-mantles, Dr. Lander said that the Board had examined a lot of experimental work done at Leeds, which tended to show, broadly speaking, that the calorific value of the gas, provided the appliances were properly adjusted, did not affect the light to any great extent.

Answering questions by Mr. Balfour with regard to the factors that determined the calorific value which would allow cheapest production, Dr. Lander mentioned that companies could not now obtain the raw materials available fifty years ago. The seams being worked now showed a gradual deterioration, which must go on.

Mr. BALFOUR asked whether there was a wider difference between calorific values throughout the country to-day than when the consumers were charged per 1000 c.ft.

Dr. LANDER said he thought there must be, or else the alteration would be to no purpose. As to appliances, Mr. Balfour's point was met by the fact that the Act provided for the replacement as well as the adjustment of appliances, and the fact that an ordinary appliance of a fairly decent quality was adjustable over wide limits.

Asked for his opinion as to the real complaint of the consumers, Dr. Lander said he could not see what the consumers' complaint was, except as regards the price.

Mr. BALFOUR asked whether, if the public were educated, first, to feel satisfied that a proper check was being kept on the calorific value, and, secondly, to read their own meters more satisfactorily, those two things alone would help to moderate any complaints that might exist.

Dr. LANDER, in reply, referred to the fact that in regard to the distribution of electricity there was the same problem. The Board of Trade unit of electricity contained 3410 B.Th.U., or was equal to 34/100ths of a therm. One therm equalled about 29·4 electrical units. This was accepted by the consumers in every case. Meters were accepted as reliable, and the system was apparently satisfactory. He agreed with Mr. Balfour that, if the change had been presented to the consumer a little more completely, in a more human form, it would probably have got over a great deal of the difficulty. The fact that instructions were printed on the back of the bills sent out by the Bristol Gas Company was pointed out to him; but he did not think anybody ever read what was on the back of a gas bill. He agreed that it was possible for all gas undertakings to adopt a well-thought-out form.

Sir JAMES MARTIN asked whether the discontent was due to two causes—namely, the inefficiency of appliances, and the rise in the gas bills without any suitable explanation having been given to the consumer.

Dr. LANDER said both must have operated.

Sir JAMES MARTIN asked whether it would not have been better if all consumers had been notified of the changes which were being brought about, and advised to have their appliances readjusted.

Dr. LANDER replied that he thought it would. He did not know what had been done. He agreed that if the consumer had been advised of the reasons for the rise in the price of gas, very likely he would not have put it down to the introduction of the therm system; but the difficulty was to convey the knowledge to the consumer.

Replying to Mr. Pugh, as to the relationship between calorific value and illuminating power, and the use of the batswing burner, Dr. Lander said that the Fuel Research Board looked upon the batswing burner as a back number.

Mr. PUGH said that, in the absence of proper and complete inspection to ensure that the calorific value of the gas was maintained, if an improper percentage of inert gases were passed through the consumer's meter, and these were included in the calculation for converting the volume into heat units, then the consumer would pay for heat units he did not get.

Dr. LANDER agreed. It was absolutely vital that inspection should be maintained in any form of gas supply, whether calorific or illuminating.

Mr. WOOLCOCK asked what were the limits of calorific power within which witness would consider gas could be efficiently dealt with in the same apparatus.

Dr. LANDER said he would not care to lay down any limits, because they might have an apparatus capable of practically no adjustability and one with a wide adjustability.

Mr. WOOLCOCK referred to figures of tests made on gas supplied by London companies, which showed that the maximum was 587 B.Th.U., and the minimum 470 B.Th.U. Therefore, the greatest variation during the period concerned in London was about 117 B.Th.U., or (say) 20 p.ct. Yet the companies concerned were keeping within the standards laid down. Was there sufficient elasticity in the working of an apparatus to deal with a variation of that kind?

Dr. LANDER replied that, without being an expert on the design of apparatus, he should say there was undoubtedly.

Answering the Chairman, Dr. Lander agreed that there was no obligation under the Act to inspect appliances. (Dr. Lander previously pointed out that adjustment must involve inspection.) As to the batswing burners, nowadays their use must be so limited as to make it impossible to legislate for them. He agreed that the incandescent mantle was not suitable for use in open shops unless special precautions were taken to protect it.

(*To be continued.*)

CONTINENTAL UNION GAS COMPANY, LTD.

The Ordinary General Meeting of the Company was held on Tuesday of last week, at Winchester House, Old Broad Street, E.C.—Col. H. LEROY-LEWIS, C.B., C.M.G., D.S.O., in the chair.

The SECRETARY (Mr. Edwin C. Bode) read the notice convening the meeting and the Auditors' report.

THE LATE DEPUTY-CHAIRMAN.

The CHAIRMAN: Ladies and Gentlemen, I beg leave to move that the report and accounts be received and adopted; but before doing so, I should like to make a few remarks on the affairs of the Company during the past year, and the things that affected us in our interests abroad. When I had the honour to address you last year, I was obliged to refer to the illness of our Deputy-Chairman, Sir Arthur Lucas. It is now my sad duty to inform you that this illness had a fatal termination. Sir Arthur Lucas was connected with our Company for 34 years, during which time he filled the position of Chairman and Deputy-Chairman. His kind and genial nature endeared him to all his colleagues, and his shrewd counsel is sadly missed by our Board. We are not alone in the City of London to regret his loss, for there are countless homes where his death will be sadly mourned. It was only natural for a man of such great sympathy as Sir Arthur possessed, for his activities to be spent in the relief of the poor and suffering; and when I say there are countless homes where his death will be mourned, I do not think that I exaggerate the loss that the Hospital for Children has sustained in the death of its Chairman. I feel sure that you would like me to convey to the family of Sir Arthur Lucas the heartfelt sympathy of the stockholders of our Company.

THE NEW DIRECTOR AND DEPUTY-CHAIRMAN.

The vacancy on our Board has been filled by the appointment of Sir James Farquharson Remnant, Bart., M.P. Sir James is a gentleman who has for many years taken an active interest in the affairs of our Company, and who is connected with many well-known undertakings in the City. I feel sure that you will ratify the choice made by your Board, for I am confident that we could not have chosen any one better fitted to fill the vacancy created by the death of our Deputy-Chairman. I am also happy to be able to inform you that Sir George Touche has been good enough to accept the office of Deputy-Chairman. Sir George regrets that he is unable to be present to-day, as he has a slight attack of influenza, from which I am glad to say he is recovering; but his doctor does not think it would be wise for him to come out yet. It is well known to you that, during the anxious years of the war, when I was otherwise employed, Sir George wisely assumed the Chairmanship of this Company; and it would be difficult to exaggerate the debt of gratitude which we owe him for having thrown himself into this ungrateful position. It would also be impertinent on my part to praise the business capacity of Sir George. His record in the City is above praise, and we must consider ourselves as extremely lucky in having secured his help as our Deputy-Chairman. ["Hear, hear."]

CONGRATULATIONS.

I have now a pleasant duty to perform, also of a domestic nature, and that is to ask you to congratulate our colleague, who was once Sir Edward Goulding, upon the high honour which His Majesty the King has been pleased to confer upon him. The end of a long and honourable career in the House of Commons, the termination of this period of a life actively spent in the public service, has been marked by the conferment of a Peerage of the United Kingdom upon Sir Edward, who will in future be known as Lord Wargrave. We cannot allow this occasion to pass without expressing to him our most hearty congratulations, and our earnest desire that his life may be spared for many a long year to come in the enjoyment of his well-deserved dignity, and in the pursuit of his many public activities. [Applause.]

THE ACCOUNTS.

I shall first call your attention to the affairs of the Continental Union, and I shall then ask you to listen to a few remarks on those of the Union des Gaz, on whose prosperity so much depends for the well-being of this Company. If you will turn to our profit and loss account, you will find that management and general charges are £402 less than last year, due to the saving made by the redemption and commutation of the pensions payable to our staff in Messina. No provision has been made for the payment of taxes, the amount set aside last year having been found to be fully adequate for this purpose. Owing to the erratic movements in exchanges, we have thought it wise to transfer the sum of £3000 to a reserve account, which we hope may not be wanted. On the credit side of the profit and loss account, you will find that the dividend paid on the preference stock, and the £750 voted to the Board, reduces the carry-forward from £6156 to £1206. I think it right to mention here that the Board were deeply touched by the spontaneous and unexpected expression of goodwill shown by the stockholders at the last general meeting; but in the future we on this side of the table have no intention of accepting any motion of this description. We think, if I may use the expression, it will be more dignified to rely solely for our remuneration, though it may be but a modest one, upon our Articles of Association, and to accept neither more nor less than is provided by these Articles. Special mention was made in the Directors' report of the apparently large decrease in the dividends and interest received this year from £21,616 to £10,419. This is due to the fact that in last year's accounts we included the dividend of £12 573 declared by the Union des Gaz in 1914, but not paid until 1921. If you deduct this sum from £21,616, you will see that the dividends and interest received during 1921 amounted to £9043, whereas this year we encashed £10,419—an increase of nearly £1400. It will be of interest to you to know that on most of our general investments the return has been an increasing one, and we have reason to expect that a further improvement will take place in the future. The income-tax refund has increased by £455, which bears eloquent testimony to the care and assiduity which our Secretary and his staff show in the discharge of their duties. Our sundry receipts are slightly higher, and call for no comment. We are thus left with a balance of £6871 19s. 2d. standing to the credit of the profit and loss account—an increase of some £800 over the corresponding figure of last year. The Board are therefore able to propose a dividend of 4 p.ct. on the preference stock—an increase of 1 p.ct. over the amount declared last year. This will absorb £5700, leaving a carry-forward of £1171 19s. 2d. I venture to think that this is a not unsatisfactory result of our year's operation, seeing that we have received no dividend on our holding in the Union des Gaz. If we now turn to the debit side of our balance-sheet, you will notice an increase of £3995 in the sundry creditors and credit balances. This is accounted for by cheques outstanding and by the amount set aside out of profits for reserve exchange, to which I have already referred. On the credit side of our balance-sheet, our investments are scheduled as gas and general; and I am happy to be able to inform you that, on our English gas and general investments, your capital is not only fully represented by its book value, but a considerable appreciation is shown.

THE UNION DES GAZ.

Would that I could say the same for our large holding in shares of the Union des Gaz, in which some eight-tenths of our capital is invested. The heavy depreciation in these shares is largely a matter of the exchanges, for their price on the Paris Bourse keeps up to a fairly high level, in spite of the fact that this Company has paid no dividends since the war, which shows that French financial circles believe that there is a future for the Union des Gaz. As far as we are concerned, we cannot, in my opinion, deal with this question; for even if we were able to sell our large holding, which is out of the question, we should be ill advised to do so, just at a time when the future is beginning to brighten for the Union des Gaz, and when also the outlook for France is by no means so bad as it is sometimes represented to be. The history of the Union des Gaz for the last eight years is bound up with the fate of its two Italian stations, Milan and Genoa. The results of the working of the Company for the years ending 1914 to 1921 culminated in a loss to the Company of 2,785,000 frs. This loss was accounted for almost entirely by the heavy deficits on Milan and Genoa, which amounted to many millions of francs. Had we been working in France, the legislation of that country would have obliged the towns, which we were serving, to have made good a part at least of this loss. But it was otherwise in Italy. The Italian authorities refused to help us in any way, and we were told to console ourselves with the thought that in the past the Union des Gaz had made considerable profits in Italy. The Directors of the Union des Gaz therefore resolved to shut-down their business in Italy, and to get rid of undertakings which were such disastrous investments. At the end of 1920 the Union des Gaz sold its Milan station to an Italian Company on conditions which were not disadvantageous. This year the Union des Gaz sold its Genoa station to the Municipality, certainly for a low price; but still, considering that the concession only had two years to run, and that at the end of the concession the Company would be faced with an enormous demand for compensation for loss of employment from its staff and workmen, it must be congratulated on having got rid of this fearful incubus. The Union des Gaz had also to put up with some serious losses on account of the working of its French stations; but, owing to the wisdom and fairness of French legislation, this state of things is past, and the French stations of the Company are now working at a fair profit.

A BRIGHTER OUTLOOK.

The accounts of the Union des Gaz for the year ended June 30, 1922, have not yet been published; but it is confidently expected that they will show a small profit, and it is even not outside the bounds of probability that a dividend may be paid on the shares of that Company. I need not point out to you what a great difference such a dividend would make in the accounts of the Continental Union, for every 1 p.ct. paid by the Union des Gaz means an addition of about £8000 to the income of the Continental Union, taking the franc at gold parity. The workings of the Union des Gaz for the current year, beginning on July 1, are decidedly hopeful—and, indeed, all gas companies in France are enjoying a period of comparative prosperity, owing to the low price of coal and the high prices obtained for residual products. The coke position in France is decidedly good. Last year at this time the stock of coke reached the record figure of 650,000 tons; this year the stock is only 90,000 tons, with the natural result that the prices have considerably appreciated. We may look forward with confidence to the end of the next financial year of the Union des Gaz; and if our prognostic is justified, the clouds which have so long hung heavily over this Company will be in a fair way towards dispersal.

THE FRENCH EXCHANGE.

When I last addressed you, I laid some stress on the question of the French exchange—an all-important one to us, for, if I am right in supposing that we are perhaps within measurable distance of receiving some return on our investment in the Union des Gaz, the question of the amount in sterling we may expect to receive for our francs is not to be neglected. The exchange question is also closely allied to that of the capital depreciation on our Union des Gaz holding, to which I have already referred. In my last address to you, I stated that I believed France would eventually pull round, and that her financial position would be completely re-established, though I warned you that long views must be taken when dealing with this problem. So that we may fully appreciate this difficult question, I must ask you to follow me in some detail, for a short time only, into the jungle of French finance and statistics. At the end of the war, France had to face a debt of 140 milliards of francs, contracted for carrying on the war, and also—and that is the peculiar position which France enjoys—reparation damages, which amounted to at least 180 milliards of francs. A milliard of francs at par equals 40 millions sterling. The problem, then, was to find the sums necessary to carry on the national services, the interest on the war debt of 140 milliards, and a capital sum of at least 180 milliards for reparation purposes. Besides this, it was necessary to fund a floating debt of 40 milliards, contracted during the war, to amortize as quickly as possible the foreign commitments of the country, and last, but not least, to provide France with the raw material, which she at that time completely lacked.

THE DEVASTATED AREAS.

The financial outlook was, therefore, very serious; and we need only turn our attention to the details of the reparation question to appre-

ciate how great was this problem, and also how near it is approaching solution. In November, 1918, there were some 200 miles by 40 miles of French territory almost completely wiped out. The population of that district in 1914 amounted to about 4,700,000; and in 1918 it had fallen to about 2,000,000. On July 1, 1922, the population had risen to 4,000,000. The land of the devastated regions had 3,300,000 hectares practically destroyed; but 2,900,000 hectares have now been made good. The agricultural land in this area had suffered to the extent of 1,900,000 hectares. There are now 1,500,000 hectares under cultivation. At the armistice there were about 453,000 houses destroyed or badly damaged. Of these some 214,000 have now been completely rebuilt and repaired. Roads had to be remade amounting to 52,000 kilometres, which have now been completely restored. All the principal railways and nearly all the local ones are again in full working order. These figures are eloquent, and show clearly that the French have not been idle during the last four years; but, of course, the expense that has been incurred in doing this work has been immense. Hence the financial difficulties of the period. The receipts of the State have never been able to balance its expenditure, and borrowing has necessarily had to be resorted to; but as the work of reparation goes on, the amount borrowed becomes less and less. In 1919 it was necessary to borrow 51 milliards; in 1920, 42 milliards; in 1921, 31 milliards; and in 1922, the amount borrowed will be about 25 milliards of francs. These loans have not been poured into useless armaments, as will be readily seen by the amounts spent in national defence. In 1919, the amount was 18 milliards; in 1920, 7 milliards; in 1921, 6 milliards; and in 1922, 5 milliards of francs, which shows clearly that France has been reducing her armament bill in a substantial way. So much for the argument of imperialism and aggressiveness in France. The 140 milliards of francs which France has had to borrow since 1919 have been spent mainly on the work of reconstruction, which ought in justice to be paid by the Germans who did the damage; and, in my opinion, we ought to help France to the best of our ability in recovering some of this money from Germany. ["Hear, hear."] I think that we have completely dispelled the legends that France does not wish to repair the damage done to her land, and that she is spending the immense sums borrowed on armaments—for I have actually heard it stated by persons who ought to be better informed, that France was trying to keep her devastated regions as a sort of museum for American tourists. I can assure you that almost every month I go through these devastated regions; and it is perfectly wonderful to see the progress made in repairing that sadly-tried part of the country.

TAXATION IN FRANCE.

There is another legend just as bad as the former one, to which I should like to draw your attention. It is often stated that Frenchmen are lightly taxed, and that little or no effort is made to extract direct taxation from their pockets. The progress of the yield of what we may call income-tax is as follows:

1916	51 millions of francs.
1917	254 ,, ,, ,,
1918	871 ,, ,, ,,
1919	892 ,, ,, ,,
1920	1,639 ,, ,, ,,
1921	2,197 ,, ,, ,,

The incidence of these taxes on individuals may be shown by the following figures, taking the most extreme case—that of a bachelor of over thirty years of age, who has no one dependent upon him. He is the most heavily taxed man in France, though really there is but little difference:

Income	25,000 frs.	pays in taxes . . .	3,100 frs.
,,	50,000 ,,	,, ,, ,, . . .	7,600 ,,
,,	200,000 ,,	,, ,, ,, . . .	60,100 ,,
,,	1,000,000 ,,	,, ,, ,, . . .	595,000 ,,
,,	5,000,000 ,,	,, ,, ,, . . .	3,495,000 ,,

It is difficult to compare these figures with our English ones, for it is true that our direct taxation brings in much larger amounts to our Exchequer than the French income-tax does; but the principal reason—perhaps not the only one—is that wealth in that country is concentrated in fewer hands, and that there are far more wealthy people in England who can be taxed than there are in France. In France there are 641 persons whose income is between 500,000 frs. and 1,000,000 frs.; in England there are 5420. In France there are 197 persons only whose income exceeds 1,000,000 frs.; in England there are 2695. For the purpose of this calculation, I have converted the franc into sterling at the rate of 50 frs. to the pound. In France these 641 persons pay 148 millions of francs to the State, and the 197 who have over 1,000,000 frs. income pay 278 millions—not a bad showing for what some people call a lightly-taxed country. It is also to be noted that our income-tax system is much older and more perfect than the French one; but their methods are getting better, and the French revenue is now showing a gratifying improvement and elasticity. The yield from taxation in October of this year amounted to 1500 milliards of francs, an increase over the Budget estimates of some 60 million francs. The increase of receipts for the whole year is estimated to be about 2 milliards of francs, of which 1 milliard 600 millions have already been collected; and the Finance Minister thinks that, owing to the stricter system of tax collecting, the ordinary Budget may balance this year.

IMPROVING FRENCH FINANCIAL SITUATION.

We have seen that the French Ministry of Finance has been obliged to borrow some 140 milliards of francs to make both ends meet during the last four years. It is important to realize in what way these loans have been made; for if, like in Germany, the void has been filled by printing bank notes, the exchange position becomes hopeless. But this is not the case in France. Ways and means advances made by the Bank of France to the Government are certainly large, but they are not unmanageable. The Law of July 31, 1920, limited the issue of bank notes to 43 milliards of francs; the Law of Sept. 20, 1920, limited the issue to 41 milliards of francs. In November, 1920, the Bank of France issued 39½ milliards of paper francs—the high-water mark of its issue; and on Nov. 9, 1922, the amount had fallen to about 37 milliards of francs. The French Treasury has certainly taken advantage of Ways and Means advances, but the amount received is not excessive, and tends to diminish. In December, 1920, the amount advanced to the State was over 26½ milliards of francs, which had fallen in October, 1922, to just over 24 milliards of francs. These figures are in no way comparable with those of the issue of the Bank of Germany, as in October, 1922, the amount of bank notes issued was about 16 milliards of pounds, taking the mark at its gold parity, and the issue has been increasing steadily at the rate of about 1 milliard of pounds per week. The circulation of the Bank of France at the corresponding period was only about £1,400,000,000, taking the franc at its gold parity; and the amount of the issue has been contracting. You will therefore see that there is no analogy between the French and the German positions. It is true that the French figures are imposing, but still they are manageable; and we see clearly that some 115 milliards of the 140 milliards have been raised by means of domestic loans in France, which makes a deal of difference to the exchange position. Another element which affects exchanges is the balance of trade. In 1919 the adverse balance of French trade amounted to 24 milliards. In 1921 it was only 2½ milliards, and will probably be about the same in 1922. These 2½ milliards are probably more than met by the invisible exports of France; so that I think we may safely say that country is now almost entirely providing for herself. I do not for one moment wish to pretend that the situation is not serious in France; but I have tried to show you that it is not desperate, and, indeed, has a tendency to improve.

FLUCTUATIONS OF THE FRANC.

You may, of course, point to my fluctuation of exchange chart [shown on the wall of the meeting hall], and ask me why, if things are improving, there should have been such violent oscillations lately. There are many reasons for this, some of a sentimental and sympathetic nature; but there is one very important one, which has escaped general observation, and which will account for a great deal. In 1916 the Bank of England discounted for the French Treasury £65,000,000 of bonds, and gold to the amount of one-third of this sum was deposited here. This amount was to be redeemed by Aug. 31, 1923. The first of this series of bonds matured in September last, and the French Exchequer announced that it would redeem the whole of the series before 1923. A sum of £6,000,000 has already been paid off, and the corresponding covering of gold returned to the Bank of France. At the present rates of exchange, the French Treasury will have to find—or have probably found, for they do not let us into their secrets—over 3 milliards of paper francs to complete their undertaking. Thus this great demand for sterling, together with the seasonal requirements of cotton, cereal, and metal bills, will go a long way towards accounting for the late vagaries of the franc. Please do not imagine that I wish you to think that the franc will return at once to gold parity, or that the situation in France is quite rosy. Such is not my intention. But I do wish to impress upon the stockholders of the Continental Union the opinion that it is expedient for us to hold on to our shares in the Union des Gaz, and that, if we take a long view of the situation, we may hope not only to be able to wipe out our capital depreciation, but also to receive a fair return upon the money we have invested. [Applause.] I now beg leave to move that the report and accounts be received and adopted.

Sir HENRY BIRCHENOUGH, Bart., K.C.M.G., formally seconded the motion; and, there being no questions asked or remarks made, it was put to the meeting, and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITORS.

Mr. A. F. PHILLIPS next proposed the re-election of Col. H. LeRoy-Lewis and Sir Henry Birchenough as Directors of the Company, and remarked that he was fortunate in having two such gentlemen to propose. They were gentlemen of great experience in the administration of companies generally, and particularly of gas undertakings. Sir Henry Birchenough had been a Director of this Company, as well as of the Imperial Continental Gas Association, for many years, and he had taken a most active part in the management. Of Col. LeRoy-Lewis, he hardly knew what to say. A more experienced and a more capable gentleman to occupy the position of Chairman, he thought it would be impossible to find. [Applause] He was absolute master of all the details connected with the administration of the Company. He (Mr. Phillips) was frequently himself in the offices in Drapers' Gardens, and almost whenever he entered he found the Chairman sitting at a desk going through a mass of correspondence. He made himself fully acquainted with everything, so that he might advise his Board as to the policy they should adopt. They must also remember that Col. LeRoy-Lewis was a splendid linguist; and as he so frequently went to Paris on the Company's affairs, this was a great advantage.

The Right Hon. LORD WARGRAVE, P.C., in seconding, said he fully endorsed everything that the proposer had stated. The Directors as well as the stockholders were greatly to be congratulated, during the most trying times that had fallen upon all industrial concerns—and especially one like theirs, which was situated in more than one country—in having in the chair Col. LeRoy-Lewis. Of his ability the stockholders themselves were just as capable of judging as any member of the Board, because they had had the pleasure of hearing him on very many occasions; but the Directors were in the position of being able to bear witness to the extraordinary energy which Col. LeRoy-Lewis had put into the Company's affairs ever since he was appointed Chairman. It was no easy matter to travel to France, or farther down to Italy, at times when the climate, sea, and other little inconveniences were of a deterrent character. But on no occasion since he (the speaker) had been on the Board had Col. LeRoy-Lewis been dissuaded from making these frequent journeys, because he felt it necessary to keep closely in touch with everything connected with the Company. They remembered what he did before the war to bring the old Continental Union into more placid waters. They were then making hard for port, with their dividends assured, when all this was interrupted by the war. As the Chairman had said, during the war they were very fortunate in having Sir George Touche at the helm; but Sir George would be the first to allow that when the Chairman came back the difficulties in front of them seemed enormous, and the hope of getting into the safe waters they were steering for before the war appeared to be a long way off. He

thought Col. LeRoy-Lewis had got the ship well into the safe waters, and that if the stockholders exercised a little more of the patience which they had already exercised so admirably, it would not be very long before the Chairman would bring them again into the position of a dividend-paying Company.

The resolution was heartily agreed to, and acknowledged by the CHAIRMAN and Sir HENRY BIRCHENOUGH.

On the proposition of Mr. WILLIAM BENNETT, seconded by Mr. HENRY JACOB, the Auditors (Mr. C. P. Crookenden, F.C.A., and Mr. G. A. Cave-Orme) were re-appointed.

VOTES OF THANKS.

The CHAIRMAN said it was now his pleasure to propose that the thanks of the meeting be accorded to the staff at home and abroad for their services during the past year. It was a great pleasure to do this, because they were very loyally served by a small but experienced staff in London. In this connection, their old friend Mr. Bode must not be forgotten. He had for 47 years laboured unremittingly, and without sparing himself, in the interests of the Company. He deserved their very best thanks, as also did his colleagues, who always helped him (the Chairman) in every possible emergency in the London offices, and those who watched over their interests abroad.

Sir JAMES F. REMNANT, Bart., M.P., said he was glad to have the opportunity of seconding the vote. During his short experience on the Board, he had always found the staff fully capable of dealing with any question that might be put before them. They had not only ability, but they had experience, which was very necessary. Their hearts were in their work, and their interest seemed to be what all would wish it to be—the success of the Company which they so faithfully served.

Mr. G. A. CAVE-ORME said that he would like heartily to support the motion, for two reasons. The first was because he was an Auditor of the Company; and the second was because he was a very old stockholder (he should think of about 40 years' standing) and also one of the very largest. He had thus at times to look into the Company's affairs, which the Directors and staff had always kindly assisted him in doing. With regard to the late Sir Arthur Lucas, he knew him for many years, and had the greatest respect and admiration for him. His was a most delightful personality, and his death was much to be regretted.

The resolution having been heartily passed by the meeting,

Mr. BODE said he would like to be permitted, in his own name and on behalf of all his colleagues in London and at the many stations on the Continent, to thank warmly those present for the kind manner in which they had received the all too flattering remarks that had been made by the Chairman.

LONDON COUNTY COUNCIL AND THERM INQUIRY.

Reference to the provisions of the Gas Regulation Act and to the therm inquiry was made at the meeting on Tuesday of last week of the London County Council.

Mr. H. MARKS asked the Chairman of the Public Control Committee whether the Board of Trade had made, under section 1, subsection 3, of the Gas Regulation Act, any Order modifying "any provisions whereby the rate of dividend payable by the undertakers or any other payment is dependent on the price of gas supplied, as appear to the Board to be necessary;" and, if so, would the Committee consider and report what effect such modification of the sliding-scale previously applicable to the London Gas Companies had had upon the standard prices now charged to consumers?

Mr. CYRIL H. M. JACOBS (Vice-Chairman of the Committee) said the answer to the first part of the question was in the affirmative. The Public Control Committee had this question under consideration in connection with a reference to them from the Council on the subject of the standard price of gas, and would bring up a report in due course.

Mr. T. D. GILBERT, M.P., asked the Chairman of the Public Control Committee whether the Committee had yet received any invitation to give evidence before the Board of Trade Committee set-up to consider the charges made by gas companies on the present therm system; and, if no invitation had been received, did the Committee propose to offer evidence on behalf of the Council in the interest of the gas consumers of London?

Mr. CYRIL JACOBS replied to the first question in the affirmative. Evidence would, he said, be given before the Departmental Committee on behalf of the Council.

Mr. GILBERT inquired as to the nature of the evidence, and asked if it would be submitted to the Council before it was given.

Mr. JACOBS, however, considered it was not in the interests of the public to give any further information at present.

Baillieston Gas Supply Area.—The Town Clerk submitted to the Glasgow Corporation Gas Committee a letter from the Law Agents of the Baillieston Gas Light Company, Ltd., asking whether the Corporation would be willing to surrender their rights to supply gas in the area at present served by the Committee. The Committee remitted the letter to a Sub-Committee for consideration and report.

Reconstruction Work at Accrington.—Alderman Dewhurst reported to the Accrington and District Gas Board last week that the new works at Great Harwood were nearly completed. They were a revelation, and a credit to the Manager. He was hoping to ask them to consider the advisability of making a substantial reduction in the price in the near future. The Manager had promised to give them reconstructed works in five years, and he had done it. The Manager (Mr. J. Harrison) said they were having difficulty in getting coal deliveries; and he suspected the collieries were selling the coal elsewhere at better prices. They had had to take 900 tons of coal out of stock during the last few weeks, which was grossly unfair. They had only one contractor who had given them regular deliveries. The Chairman said they would bear those collieries in mind when they were giving out their next contracts.

EXPLOSION IN AN EXHAUSTER HOUSE AT BECKTON.

At 3 o'clock last Thursday afternoon, a trial run was being made at the Beckton works of the Gas Light and Coke Company with a new set of steam-driven turbo-exhausters which had been installed to deal with the gas from the additional water-gas sets recently put into operation. The trial was being made with both the inlet and the outlet valves closed, in order to test the general running of the machine. A satisfactory run was nearing completion when an explosion occurred, which fractured the exhauster casing and broke the disc of the outlet valve, allowing a quantity of gas to get back from the common outlet through the damaged casing into the exhauster-house.

The alarm was immediately given; but within two minutes, before the first set of oil-gas plant and other apparatus could be closed-down, a large amount of gas had escaped into the building, and a heavy explosion resulted, injuring 23 men, including several members of the staff who were conducting the trial of the plant. Twenty cases had to be sent to the hospital, and eight of the men were detained—their injuries consisting of burns to the hands and face, and cuts through falling glass.

The plant in the exhauster-house in which the explosion occurred is capable of dealing with approximately 40 million c.ft. of gas per day. The whole of the plant had to be closed-down as a result of the accident, but was restarted at the 2 p.m. shift the following day. The set which was being tested was designed to deal with 600,000 c.ft. of gas per hour, at a pressure of 7 in. water gauge, and delivering at a maximum pressure of 57 in. The exhauster is driven by an impulse type steam-turbine of 120 B.H.P. running at 7500 R.P.M.

The exhauster-house is a substantially constructed building 149 ft. long by 29 ft. wide. The whole of the windows were blown out, and part of the roof covering was removed by the explosion; but otherwise the building was not seriously damaged. With the exception of the new blower, practically none of the valuable machinery in the house was damaged.

It was entirely due to the great presence of mind on the part of the staff, the valvemen, and the water-gas plant operators in so promptly closing-down the plant and isolating the gas connections, that much more extensive damage did not take place.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Kibworth Gas Company—450 B.Th.U. (Jan. 1, 1923.)

Windsor Royal Gas Light Company.—480 B.Th.U., in substitution for 450 B.Th.U. (March 20, 1923)

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Pontypridd Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16 4d. per therm. (Dec. 9.)

ECONOMIC POSSIBILITIES OF GAS IN BUILDING CONSTRUCTION.

By arrangement with the North Middlesex Gas Company, Major F. Cornelius Wheeler, Manager of the Nautilus Fire Company, last Thursday afternoon delivered a lecture in the King Edward Hall, Finchley, on "The Economic Possibilities of Gas in Building Construction." The gathering was one of a kind which cannot fail to result in good. Local architects and builders had been invited to come and hear about something which is of great concern to them, and those who did so were evidently keenly interested. At the close of the lecture, there was a lengthy discussion on all manner of gas topics. This was, of course, mainly of a conversational nature, and revealed a general appreciation on the part of the audience of the capabilities of gas.

At the outset, Mr. W. L. Westbrook, who took the chair, apologized for the unavoidable absence (owing to an important business engagement) of Mr. L. Trewby, the Engineer and Manager of the North Middlesex Gas Company, and on his behalf extended a hearty welcome to the visitors. He expressed the hope that the lecture would prove of benefit both to them as architects and builders and to the Gas Company. The question of heating and hot-water supply was a very important one, particularly in connection with new buildings. The climate of this country rendered a flexible fuel like gas particularly suitable for heating purposes. Cost, both in respect of initial outlay and running expenses, was a vital factor. The lecture would bear upon the first matter; while as to the second, he might say that his Company had been steadily reducing the price of gas. They were now approaching the pre-war rate, and hoped soon to be down to that level again—or even below it.

Major Wheeler divided his subject under four headings—the economic possibilities of gas from (1) the national point of view, (2) the economic point of view, (3) the labour-saving point of view, and (4) as an aid to economic construction. He argued that the principal advantages of the use of gas are its efficiency, which, from a heating point of view, is about double that of solid fuel; its cleanliness, and,

with all modern gas apparatus, the complete absence of noise and smell, and the ease in which the temperature can be regulated. In cases where continuous heating is required, these advantages often more than compensate for the higher cost of gas when measured by thermal units; while for rooms which only require intermittent heating, the cost is less than solid fuel. The quantity of sulphurous and sulphuric acid fumes from a gas-fire is very much less than that from a coal-fire, and there is an entire absence of the soot and smoke which are so deleterious to the community in general. The witnesses who appeared before the Smoke Abatement Committee almost without exception condemned the old-fashioned kitchen range and back boiler, which in a brave endeavour attempts to warm the room, supply hot water, and heat the oven and hotplate—but at what a cost of fuel, labour, creation of dirt, dust, and soot.

Coming to the patent concrete gas-flues, Major Wheeler said that Sir William Bennet, F.R.C.S., at a gas conference, remarked that a properly installed gas-fire ensured a certain amount of ventilation, as a coal-fire does; and he was strongly of the opinion that no form of heating is really suitable for domestic purposes—and, indeed, should not be permitted by law in certain circumstances—which does not provide automatic ventilation in this way. The one great advantage claimed for the coal-fire is the fact that it affords ventilation—a very important factor in domestic heating. There is now on the market a cast concrete gas-flue, invented and patented by one of our most eminent architects, which it is believed will not only revolutionize present methods of gas-flue construction, but will ensure very much more efficient ventilation, and will be a means of effecting considerable economies in construction—at the same time giving greater floor space and cubic capacity in the rooms. To meet the recommendation of the London County Council, these flue blocks are cast in the following proportion: 2 volumes of sharp sand, ½ volume of Portland cement, and ½ volume of super cement.

The London County Council, the Office of Works, and many of the Housing Authorities throughout the kingdom, are now installing built-in gas-fires for the bedrooms and parlours, with one coal-fire for the living room. The progress made in gas-flue construction has been largely brought about by the excellent propaganda work of the British Commercial Gas Association. The introduction of the narrow gas-flue built in the thickness of the partition or external wall has rendered obsolete the old-fashioned 9 in. by 9 in. brick-built flue, into which it has been customary in the past to take the products of combustion. The lecturer drew attention to comparative plans of the "parlour type house" as designed originally for coal-fires and subsequently re-designed for the adaption of small concrete flues and gas-fires. He pointed to the resultant gain of floor space and cubical contents of the rooms, and quoted figures showing the great saving in building costs which accompanied the securing of these advantages. He went on to remark that with the ordinary coal-flue construction the convenience and comfort of a room have frequently to be sacrificed to the arbitrary position of the fireplace, owing to the fact that the flues must be grouped together for economic reasons. With the concrete gas-flue, the most suitable of the four walls can be selected for the position of the fire, due regard being given to the presence of windows, doors, and furniture. How often one finds in otherwise well-planned houses that one or two rooms are spoilt by the door opening on to the fireplace, or the accommodation round the fire is made uncomfortable and draughty, being placed midway between the windows and the door. He had been informed that the Committee engaged on the re-drafting of the London County Council Building Acts will incorporate special clauses dealing with gas-flue construction of the type to which his lecture referred. These revisions will, he added, no doubt form the basis of all new Building Acts throughout the country.

At the close, the lecturer was heartily thanked, on the proposition of Mr. C. W. Scott, seconded by Mr. Gillett, who said it was certainly a move in the right direction to invite practical men to come and hear lectures such as that which had just been delivered.

TRADE NOTE.

"Supastone" Glassware.

The Wholesale Fittings Company, Ltd., of Nos. 23-27, Commercial Street, London, E., have prepared a four-page supplementary leaflet descriptive of "Supastone" three-ply glassware—the inside opal glassed, centre clear flint, and outside polished satin matted. This special glassware, introduced at a low price, they say, produces an intense white light of glareless reflection very restful to the eyes; while the smooth internal and external surfaces are easy to clean. The illustrations show it to be ornamental in appearance.

Prepayment Meter Theft.—At Burton-on-Trent Police Court last Friday, George Parker was sentenced to three months' hard labour for stealing 12s. 2d. from a prepayment meter, the property of the Corporation Gas Department.

Yorkshire Price Reductions.—The Pudsey Gas Company have given notice of a reduction in the price of gas to 9·8d. per therm, as from Jan. 1. The Royston and District Gas Company, Ltd., announce a reduction, from the same date, to 5s. 3d. per 1000 c.ft. through prepayment meters, 4s. 9d. by ordinary meters, and 4s. 4d. for engines. The Elland-cum-Greetland Gas Company state their new price at 1s. per therm.

Reduction at Newcastle (Staffs.).—The Gas Committee of the Newcastle (Staffs.) Town Council have decided that, commencing with the meter readings for the December quarter, a discount of 3d. per 1000 c.ft. will be allowed for prompt payment of accounts. The Chairman (Alderman Scott) said the reduction was not so much as the Committee had expected it would be; but they hoped to be able to make a further concession in the new financial year.

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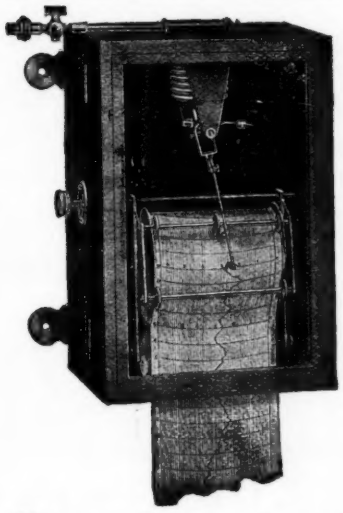

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Lowest Range: 0-2 inches water.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 18.

The London tar products market is almost unaltered. Pitch is nominally about 122s. 6d. net per ton, with small supplies offering. Creosote remains at about 8¼d. net per gallon in bulk at makers' works.

Tar Products in the Provinces.

Dec. 18.

The average values for gas-works products during last week were: Gas-works coal tar, 68s. to 73s. Pitch, East Coast, 115s. to 117s. 6d. f.o.b. West Coast—Manchester, 110s. to 112s. 6d.; Liverpool, 111s. to 113s.; Clyde, 112s. 6d. to 115s. Benzole 90 p.ct. North, 1s. 9d. to 1s. 10d.; crude 65 p.ct. at 120° C., 1s. 1¼d. to 1s. 2½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 10d. to 1s. 11d. Toluole, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk, North, 8¼d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 2s. to 2s. 1d. Creosote, in bulk, North, liquid, 6¼d. to 6⅜d.; salty, 6d. to 6¼d. Scotland, 5¼d. to 5⅜d. Heavy oils, in bulk, North, 6¼d. to 6½d. Carbolic acid, 60 p.ct., 2s. 4d. to 2s. 7d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

Nothing fresh has transpired since the last report. The weakening tendency then noted has continued, and is due to a falling-off in orders owing to the holiday feeling, coupled with some increase in outputs due to more coke-ovens coming into operation. Pitch has dropped to £5 10s. to £5 15s. per ton f.o b. East Coast. London prices are about £5 5s.; while in South Wales and the Midlands the value ranges from 80s. to 95s. There is no alteration in values of creosote or solvent naphtha, and naphthalenes remain a dull market. Cresylic acid is rather better at 2s. 6d. per gallon, and crude carbolic acid at 2s. 2d. per gallon. Carbolic crystals are still in demand, and make 8¼d. per lb. In intermediate products, the feeling is rather dull; there having been some falling-off in inquiries from the Continent.

Sulphate of Ammonia.

This market remains practically without any change. Outputs are increasing slightly, and it is satisfactory to know that much of the increase is in neutral quality salts. Demand in the early months of next year will be heavy, judging by accounts from the agricultural centres, in most of which farmers have not yet placed orders for their requirements.

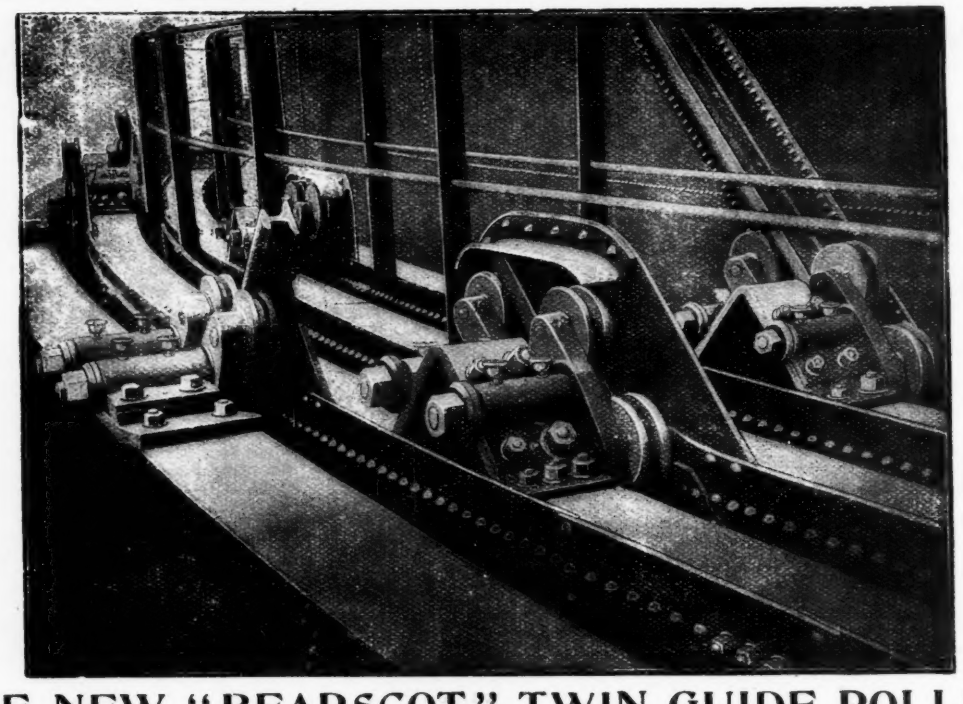
Power-Gas Corporation.

Mr. E. Lloyd Pease (the Chairman), presiding at the 22nd general meeting of the Corporation, said that, like most other concerns, they were at the moment living "from hand to mouth" in the matter of orders; but the Board could only hope there might be better times ahead. The Managing Director (Mr. Wilfrid Beswick) remarked that the Corporation had made definite progress in putting on the market new specialities. These included plant for the production of high-grade gas for industrial and domestic purposes. They had now seriously entered this line of business, and hoped they would be able to reap increasing advantage therefrom in the future. He proceeded: The improvements in our system of power-gas production have been partially adapted to existing plants; and it is interesting to know that, as a result of these, the South Staffordshire Mond Gas Company are applying for parliamentary powers to supply gas to local authorities for illuminating and domestic purposes. By changes in the working of the Mond gas system, the operating costs can be reduced substantially, while the calorific value of the gas is increased, and its quality becomes suitable for other than manufacturing purposes. In these days of costly town gas, and with the introduction of the therm system of charging for the gas, there is a wide possibility for use of lower grades of gas, such as is produced in our plants, with great benefit in first cost. We are satisfied that the production of power gas, with recovery of bye-products, can once more be carried on efficiently and economically, and that our system still provides the cheapest source of gas for power and heating. Unfortunately, however, the progress of the big gas-engine has remained almost stationary, and this has arrested our work in the line of large power stations. We are hoping for some developments in the big internal combustion engine, which will enable our power-gas plants to be used on a wider scale.

Congleton Gas Price Lowered.—The Gas Committee of the Congleton Town Council have decided to reduce the price of gas by a further 2d. per 1000 c.ft., at the end of the year.

Reduction in Price at Harpenden.—The Directors of the Harpenden District Gas Company give notice that the price of gas will be reduced by 1d. per therm (equal to 4½d. per 1000 c.ft.), as from the reading of the meters at the Christmas quarter.

New Issue of Leatherhead Capital.—As will be seen from an announcement which appears in our advertisement columns, the Leatherhead Gas and Lighting Company are offering for sale by tender 1000 ordinary shares of £10 each. The Company's parliamentary area comprises about 40 square miles in the county of Surrey, and is a district which is ripe for development. The demand for gas is rapidly increasing. In 1914 the sale was 64 million c.ft., and in 1922 110 millions. The last dividend paid was at the rate of 6½ p.ct., and the price of gas, which is now 1s. 1½d. per therm (equal to 5s. 9d. per 1000 c.ft. of 500 B.Th.U. gas) entitles the Company to a still higher dividend.



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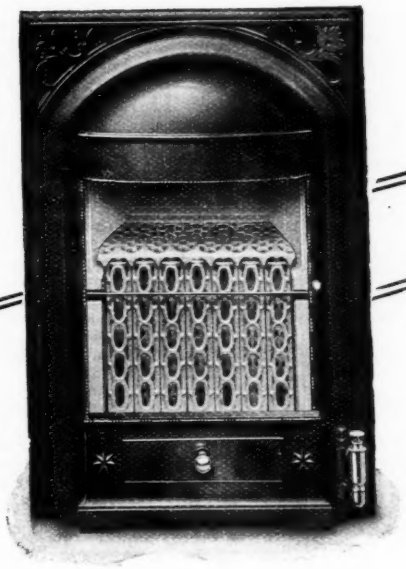

No matter what make of Gas Fire realises your ideal, it will be to your advantage to enquire about the CARRON PATENT

"STELLA"

The Silent Fire.

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Offices: Manchester — Newcastle-on-Tyne — Leed, and Birmingham.

FOUNDED
— 1759 —

Progress in Gas-Fire Construction.

A most successful lantern lecture was given last Thursday, at the request of the Bath Gas Light and Coke Company, by Mr. F. Harvey, of the Radiation Technical Staff. There was a large attendance of the Gas Company's staff and of members of the gas-fitting and plumbing industries; and a thoroughly practical demonstration was given to them of the enormous progress which has been made in gas-fire construction, evidenced by the present Radiation models. A selection of burners and parts was available; and the lecturer demonstrated very effectively the improvements which the Radiation patents made possible. In particular, the explanation of the patent injector-ventilator was received with great interest. He showed that the Radiation thermo-radiant gas-grates have two openings under the canopy leading to the flue. The lower, or "injector," opening carries away the entire combustion products, and the upper, or "ventilating," opening carries away a large volume of air drawn from the room. The ascending current through the lower outlet promotes by injector-action the ventilating function in the outlet above. The result is that, while pure radiant heat is distributed throughout the room, the air of the room is changed a sufficient number of times to ensure an agreeable and healthy atmosphere being maintained. It was mentioned that there are between 15,000 and 16,000 gas-fires in use in Bath at the present time.

Redhill Co-Partnership Meeting.

The ninth annual meeting in connection with the Redhill Gas Company's co-partnership scheme was presided over by Mr. G. R. Hunt, J.P. (the Chairman of the Committee), who was supported by the Deputy-Chairman, Mr. W. H. Bennett (Managing Director), Mr. W. Lees Stenning, J.P. (Chairman of the Company), Mr. Harrie Stacey, and Mr. R. H. Mew (Directors), Mr. Horace Long (Secretary), and Mr. Ernest Scears (Engineer). The Committee, in their report, noted with great pleasure the very real progress evinced by the creditable figures presented—both as regarded the increased number of co-partners on the register and the growth of the bonus (investment) fund, with the consequent acquisition of capital stock by nearly every officer and employee of the undertaking. In fact, from the position of affairs as shown in the statement of accounts, it might be justly considered that the co-partnership scheme had at last matured, since the year's working marked for the first time the attainment of its full scope and effect in the organization and activities of the Company generally. Under the revised rules approved and passed at the last annual meeting, the Directors had announced a bonus for the past year at a rate equal to the percentage payable on the ordinary stock of the Company. The bonus declared was accordingly increased from 2 to 5 p.ct.; and the sum credited to the co-partners for bonus and interest amounted to £961, as compared with £279 in the previous year. Since the inception of the scheme the bonus funds, together with interest on uninvested balances, had accumulated to a substantial sum—exceeding £2400. The Chairman remarked that on no former occasion had the Committee been able to bring before them a report so satisfactory in every way as that now presented. Mr. W. H. Bennett said that at the last meeting the scheme was referred to as being "his baby." If this were true, he ventured to suggest that it was a very healthy one. The report and accounts were unanimously adopted.

Price Reduction Recommended at West Bromwich.—The West Bromwich Corporation Gas Committee recommend that, from the December readings of the meters, the price of gas for lighting purposes be reduced 3d. per 1000 c.ft. to 4s. 3d., and that for power and manufacturing there be a graduated scale, according to consumption, ranging from 3s. 10d. to 2s. 10d. per 1000 c.ft. (subject to 5 p.ct. discount for prompt payment).

Gas Testing at Dunstable.—Mr. Sidney Feminger, F.C.S. (the Gas Examiner), has written to the Dunstable Town Council calling attention to a deficiency in the calorific value of the gas supplied by the local Company when he made tests on Dec. 12. The first test, at 3.40 p.m., showed 421·4 B.Th.U.; and the second test, at 4.45 p.m., recorded 434·1 B.Th.U. The average of the three tests during the quarter must show the Company's declared figure of 450 B.Th.U.; and, as the average of the two tests to date was 449·7, the third test must show at least 450·3 B.Th.U.

Gas Matters at Beverley.—In connection with the reconstruction of the Beverley District Council's Gas-Works, now in progress, it was stated at a meeting of the Council last week that attention would have to be turned to the gas mains. The Chairman of the Gas Committee said there was hope of getting a grant from the Unemployment Grants Committee to assist in the matter. It was apparent something would have to be done in regard to the mains. In answer to a question, he said he was afraid he could make no promise of a reduction in the price of gas at present. They had already heavy capital charges on the works.

Gas and Electricity Competition at Walsall.—At the last meeting of the Walsall Town Council, on a recommendation of the Electric Supply Committee that plant should be installed at a cost of £1660 to give a supply of current to a Bloxwich company who had given a guarantee of a minimum payment of £60 a quarter for five years, there were complaints of the waste resulting from competition between the electricity and gas departments. Alderman J. Cope stated that only about a month ago the gas department laid a new 7-in. main in order to give a supply to the same works. Mr. J. A. Leckie (the Chairman of the Gas Committee) said this fact afforded an illustration of what was going on. The output of electricity was being increased purely at the expense of the gas department. Alderman E. H. Ingram said they had to consider such applications on their merits, without inquiring whether the gas department had previously been supplying the applicants. Alderman Cotterell said that the Gas Committee should have protected themselves in the same way as the Electricity Committee did, by demanding guarantees for a certain period. The recommendation was approved.

STOCK MARKET REPORT.

THE Stock Exchange last week began early to show symptoms of approaching Christmas. Though the prevailing tone steadily improved, yet business fell quieter, and took little heed of cheering factors. Gilt-edged articles were firm, and Home Governments on Friday marked: Consols 55⅝-56⅛. War Loan 99 7/16-99⅞. Funding 85⅝-86, Victory 88⅜ 88¾. Rails of all sorts were variable. The Foreign Market was irregular, but at the close there was a demand for Turks.

Business in the Gas Market began to assume its holiday proportions early, and ruled very quiet from start to finish. The general tone was very good; but Gas Light ordinary and South Metropolitan fell 1 each. Several debenture stocks were quoted *ex div.* at an advance, thus: Brentford gained 2, Commercial 1½, Gas Light ½, Tottenham 2. In the Continentals, Union preference rose 2½, and Imperial ordinary and debenture 5 each. Newcastle ordinary rose ½.

The following transactions in gas were recorded during the week: On Monday, Brentford 4 p.c. debenture 78, Commercial 3½ p.c. 96, Gas Light ordinary 94½, 94⅜, 95, 95⅛, ditto 3½ p.c. maximum 63, 63½, ditto 4 p.c. preference 77⅛, 78, Imperial Continental 149¼, 150, 151, Primitiva 5 p.c. preference 43s. 9d., 45s. 6d., South Metropolitan 94½, 95¼, ditto 5 p.c. preference 96⅜, ditto 3 p.c. debenture 60, Liverpool 7 p.c. preference 105½. On Tuesday, Alliance and Dublin 62½, Brentford "A" 101, Continental Union 7 p.c. preference 56. 57, Gas Light ordinary 94½, 94⅜, 94¾, 95, 95⅜, 95¼, ditto 3½ p.c. maximum 63¼, 63½, 64, ditto 4 p.c. preference 77, ditto 3 p.c. debenture 62½, Hong Kong and China 6⅜, Imperial Continental 149, 150, 150½, 151½, ditto 3½ p.c. debenture 77, Primitiva 14s. 6d., ditto 5 p.c. preference 45s. 3d., 45s. 6d., South Metropolitan 6½ p.c. debenture 106½, South Suburban 98, 99, Tottenham "B" 100¼, 100½, ditto 4 p.c. debenture 76, Swansea 6½ p.c. debenture 104½, 104½, 105, Harwich 7 p.c. 65s., Gloucester 82¾, Danish 5 p.c. preference 6, 6⅛, Tottenham 6 p.c. mortgage 99⅜, 100, Walton and Weybridge 10 p.c. maximum 14½. On Wednesday, Commercial 4 p.c. 94, 94⅜, ditto 3½ p.c. 94½, 94⅜, 95⅛, Continental Union 7 p.c. preference 56, 57, European 9½, Gas Light ordinary 94½, 95, 95⅛, 95¼, ditto 3 p.c. debenture 61½, Hong Kong and China 6½, Imperial Continental 152, ditto 3½ p.c. debenture 76⅜, 77½, Primitiva 5 p.c. preference 45s., 45s. 6d., 46s. 3d., South Metropolitan 94⅜, 95, ditto 3 p.c. debenture 61, Tottenham "B" 100⅓, Hong Kong 5 p.c. debenture 70½, Grays and Tilbury 4 p.c. debenture 70. On Thursday, Commercial 3 p.c. debenture 57½, Gas Light ordinary 94½, 95, 95⅛, Imperial Continental 152½, 153, Primitiva 13s. 6d., ditto 5 p.c. preference 45s., 45s. 7½d., South Metropolitan 95¼. On Friday, Bombay 96s. 3d., Brentford "A" 100¼, European 9½, Gas Light ordinary 94½, 94⅝, 95, ditto 3½ p.c. maximum 64, ditto 4 p.c. preference 77, 78½, ditto 3 p.c. debenture 60, Imperial Continental 152½, 153½, 155, 157, ditto 3½ p.c. debenture 80, 81, Primitiva 5 p.c. preference 46s. 3d., 46s. 9d., South Metropolitan 94½, 94½, 94¾, 95, ditto 5 p.c. preference 96⅜, ditto 3 p.c. debenture 61½, South Suburban 5 p.c. debenture 97½, Tottenham "B" 101½, Croydon 7½ p.c. preference 101½.

In the Money Market, the demand for accommodation fluctuated considerably, almost from day to day; but supplies were fully equal to the maximum requirements, and at the close of the week the position was very easy. Discount rates ruled very steady throughout. Silver had a severe fall in price owing to heavy sales in the far East; the reduction being 1 7/16d. The Bank of England rate was 3 p.c., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
182,049	Stk.	Aug. 24	4	4%	Aldershot 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	62—67	62½
1374,000	,,	July 13	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅞—6⅛	4⅛—5	96/3
100,000	5	Aug. 10	16	7½%	Bournemouth Gas and Water: 5 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bournemouth Gas and Water: B 7 p.c.	15—15½	11—12	...
115,000	10	,,	6	6%	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	8½—9½	...
162,065	—	June 29	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	..	73—78	...
992,045	Stk.	July 27	14	61/-	Brentford A Consolid.	261—266	100—103	100½—101
734,920	,,	,,	11	61/3	Do. B New	204—209	100—103	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	78—80*	78
214,775	,,	Aug. 24	11	11%	Brighton & Hove Orig.	208—213	165—170	...
244,200	,,	,,	8	8%	Do. A Ord. Stk.	154—159	120—125	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	89—91	...
530,000	20	Oct. 5	12½	22/6	British	44—45	32—34	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—60	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	June 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	93—98	94—94½
560,000	,,	,,	5½	55/-	Do. 3½ p.c. do.	103—105	93—98	94½—96
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60*	57½
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	29—34	...
200,000	,,	Dec. 14	7	3%	Do. 7 p.c. Pref.	115—118	52—57*	56—57
660,008		Sept. 1	—	6%	Croydon sliding scale.	..	96—101	...
284,975		,,	—	4%	Do. max. div.	..	80—85	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
1,002,180	10	July 13	10	5/0	European, Ltd.	17½—18	9½—10½	9½
16,298,975	Stk.	July 27	4/17/4	52/-	Gas Light: 4 p.c. Ord.	98—102	94—96	94½—95½
2,600,000	,,	,,	3½	35/-	Gas Light: 3½ p.c. max.	76—79	61—64	63—64
4,062,235	,,	,,	4	4%	Gas Light: 4 p.c. Con. Pref.	96—99	76—81	77—78½
4,674,850	,,	Dec. 14	3	3%	Gas Light: 3 p.c. Con. Deb.	72½—74½	60—63*	60—62½
130,000	,,	Dec. 11	10	10%	Coke: 10 p.c. Bonds	..	..	..
	—	—	—	—	Coke: 7½ p.c. Ilford Deb	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	77—80	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16¾	6—7	6⅜—6½
86,600	Stk.	Aug. 24	9	9½%	Hornsey 7 p.c.	..	127—132	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	153—158	149—157
404,800	,,	Aug. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	77—82	76½—81
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	...
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	June 29	—	3%	Do. 3 p.c. Deb	..	54—59	...
73,000	5	,,	6	6%	Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb.	4½—4¾	3½—4	...
250,000	100	Oct. 2	4½	4½%		99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11½—12	5⅜—6⅜	...
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'd Con.	98½—99½	81—82	...
529,705	,,	June 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	69—71	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Aug. 24	7/14/0	7/88	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	Nov. 30	8	8%	Oriental, Ltd.	117—122	95—100	...
60,000	5	—	10	—	Ottoman, Ltd.	7½—7¾	⅜—1⅜	...
188,120	Stk.	June 29	—	6/3/9%	Plym'th & Stonh'se 5 p.c.	..	93—98	...
60,000	50	Aug. 24	13	65/-	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	60/-	Do. C	118—121	85—90	...
249,980	5	—	8	—	Primitiva Ord.	5½—6	5/16—7/16	13/6—14/6
499,960	5	—	5	—	Do. 5 p.c. Pref.	4¾—5	2½—2¾	43/9—46/9
521,600	100	Nov. 30	4	4%	Do. 4 p.c. Deb.	91—93	68—73	...
600,000	Stk.	July 27	4	4%	Do. ,, ,, 1911	..	55—60	...
346,198	,,	June 29	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	...
150,000	10	Sept. 21	6	6/-	San Paulo: 6 p.c. Pref.	10½—11	5½—6	...
125,000	50	July 3	5	5%	San Paulo: 5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 24	10	5%	Sheffield A	223—224	97—99	...
209,984	,,	,,	10	5%	Do. B	222—224	97—99	...
523,500	,,	,,	10	5%	Do. C	220—222	97—99	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Nov. 2	9	7%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	South Met. Ord.	111—113	94—96	94½—95½
250,000	,,	July 13	—	5%	Do. Red. Pref.	..	95—97	96½
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	60—63	60—61½
224,820	,,	Aug. 24	8½	8½%	South Shields Con. Stk.	157—159	108—110	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	97—100	98—99
368,837	,,	June 15	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	97½
647,740	,,	Nov. 2	5	7%	Southampton Ord.	99—102	77—82	...
121,275	,,	June 29	4	4%	Do. 4 p.c. Deb. Stk.	..	70—75	...
120,000	,,	July 27	—	7½%	Tottenham: A 5 p.c.	135—138	112—117	...
782,275	,,	,,	6	6%	Tottenham: B 3½ p.c.	115—117	100—103	100½—101½
181,255	,,	Dec. 14	4	4%	Tottenham: 4 p.c. Deb.	87—89	75—80*	76
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	⅛—⅜	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	20—30	...
236,476	Stk.	Aug. 24	5	2½%	Tynemouth 5 p.c. max.	108½—109	79—81	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 27	8½	72/6	Wandsworth A 5 p.c.	151—156	111—115	...
235,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	95—100	...
108,075	,,	,,	—	50/9	Do. C.	..	87—92	...
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	...
352,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	95—100	...
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	95—100	...
88,416	,,	June 29	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

* Ex Div.

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Slot-Meter Discounts at Chesterfield.—The Chesterfield Corporation Gas Committee have agreed that the following addition be made to a resolution passed in March last, relating to the charges to consumers supplied through prepayment meters: "In all cases where no gas fittings or appliances (other than the meter) have been supplied at the cost of the Corporation, the charges shall be subject to a discount of 6d. per 1000 c.ft."

Stockton-on-Tees Gas-Works Fire.—Alderman J. M'Naughton (the Chairman of the Gas Committee) told the Stockton Corporation last week that the recent fire at the gas-works did damage to the extent of about £1000, which was fully covered by insurance. The Gas Committee had held a preliminary investigation, and had come to the unanimous conclusion that the outbreak was purely accidental. Mr. Bollands said he was not altogether satisfied, and asked if it was intended to make an exhaustive inquiry into the matter. Alderman M'Naughton replied that the most searching investigation would be made.

Coke-Ovens and Bye-Products Recovery.—In the course of the proceedings at the meeting of Messrs. Dorman, Long, & Co., Ltd., the Chairman (Sir Arthur J. Dorman, K.B.E.) referred to the Company's holdings in other undertakings. Among these is the whole of the ordinary share capital of Messrs. Bell Bros., Ltd. This firm own numerous collieries, and are building a new battery of coke-ovens. Their bye-product installation is a modern one, and in addition they have a rectifying plant in which all the crude products produced by the various plants of the allied companies are refined. Their output of rectified benzole will shortly exceed 2,000,000 gallons per annum, with 50,000 gallons of tar acids and 100,000 tons of various other oils and bye-products, including sulphate of ammonia.

The Directors of the European Gas Company, Ltd., have decided to pay, on Jan. 31, an interim dividend of 5s. per share, free of income-tax.

Damage, estimated at £1500, was caused by a fire at the steel works of Messrs. Thomas Firth & Sons, Ltd., Sheffield. It is believed that the outbreak was due to a rat eating through the insulation of an electric cable.

The Directors of Messrs. Gibbons (Dudley), Ltd., have declared the remaining 3½ p.ct. dividend upon the 7 p.ct. preference shares, and a further interim dividend of 3½ p.ct. upon the ordinary shares, making 7 p.ct. for the year, free of income-tax, payable on Jan. 1.

Some damage was caused to premises in High Street, Camden Town, on Monday by a gas explosion. It occurred in a room over a shop, and was caused by the tenant striking a match while endeavouring to detect the source of an "odour of gas."

The Gas Committee, at the last meeting of the Halifax Town Council, reported the appointment of the Chairman (Alderman J. H. Waddington) and the Engineer (Mr. W. B. M'Lusky) as representatives of the Committee on the Gas Employers' Federation, the National Gas Council, and the "B.C.G.A." Mr. E. W. Lyon opposed the minute, on the ground that it was like giving the Committee a blank cheque. He said there was no information as to how far the representatives would have to travel, at the public expense, or how long the meetings or conferences would last. He held that the appointment of representatives should not be made until notification of the respective conferences was received. The Corporation's confidence in the necessity of being represented at the conferences, wherever they may be held, was illustrated by the objection receiving no seconder.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

CHRISTMAS HOLIDAY.

In consequence of the Christmas Holiday, all communications for the next issue of the "JOURNAL" should reach the office not later than the first post on Friday, Dec. 22.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words) 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

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Applications, stating Qualifications and accompanied by *copies* of not more than Three recent Testimonials, and endorsed "Deputy Gas Engineer," must be forwarded to the undersigned not later than Saturday, the 30th of December, 1922.

J. ERNEST JARRATT,
Town Clerk.

Town Hall,
Southport,
Dec. 6, 1922.

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Tenders, enclosed in sealed covers and superscribed "Tender for....," must be addressed to the Deputy Chairman of the Corporation, and will be received by him up to 2 p.m. on Monday, the 5th February, 1923.
Tenders must be accompanied with an earnest deposit of a sum equivalent to not less than 2½ per cent. of the total value of the Tender, which, in the case of the successful Tenderer, will be raised to 5 per cent. as security deposit.
Tenderers are required to submit Tenders in their own Forms, and must abide by the rules with regard to tenders in vogue in the Corporation.
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B. V. RAMIAH,
Secretary to the Corporation.

Central Municipal Office,
Nov. 23, 1922.

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